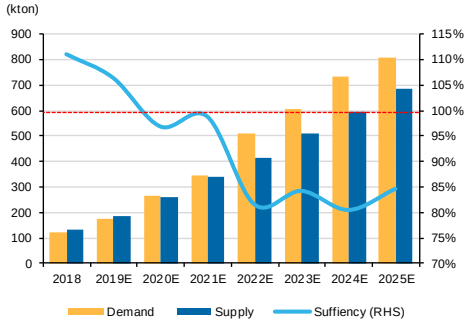
EQUITIES

EV battery copper foil supplier valuations

Comp	Code	Rec	TP (Lcy)	U/D	Mkt Cap (US$m)	PER (x) 2020E	PER (x) 2021E	EPS grth (%) 2020E	EPS grth (%) 2021E
SKC	011790	OP	75k	63%	1,480	15.7	9.8	84.3	60.9
Iljin	020150	OP	48k	30%	1,538	22.8	14.0	44.5	63.1
Solus	336370	NR	na	na	484	21.4	14.7	n/a	n/a

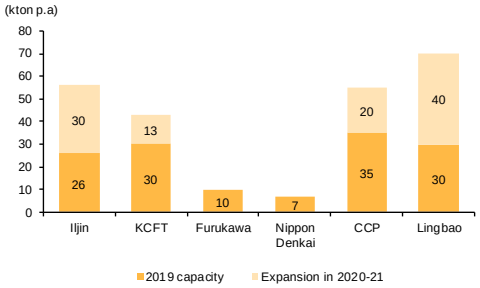
Source: FnGuide, Macquarie Research, Share prices at close 4 December 2019

Battery copper foil will be a seller's market through 2025E



Source: SNE Research, Company data, Macquarie Research, December 2019

Iljin and SKC can take advantage of Japanese players' conservative expansion



Source: Company data, Macquarie Research, December 2019

Inside

Related research:
Asia EV batteries - Winners and losers in a bifurcated market (20 November 2019)

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Korea EV battery materials
Bullish on EV battery copper foil

Key points

- We initiate coverage of SKC and publish a MacVisit note on Doosan Solus, as a read-across to a new entrant to the market.
- We are increasingly positive on the EV battery copper foil sector on strong demand for ultra-thin copper foil and product supply constraints.
- We have two Outperform ratings – Iljin Materials and SKC – the two market leaders in battery copper foil.

Event

- We initiate coverage on SKC (011790 KS), which recently acquired KCFT, the industry leader in EV battery copper foil. We also publish a MacVisit note on Doosan Solus (336370 KS), a new player making a push into the industry, as a read-across to a new industry entrant.

Impact

- **Battery copper foil to be seller's market throughout 2025E.** We forecast EV battery copper foil demand CAGR of 30% during 2019-25E and expect the market to see supply shortage from 2020 (Fig 1). The major driver of copper foil demand is skyrocketing growth of large-sized battery (40% CAGR during 2019-25E based on kWh) despite a copper foil content decrease per kWh (0.75kg/kWh in 2019 to 0.55kWh/kWh in 2025E). The ultra-thin segment (under-6 ㎛ thickness) should particularly see a severe supply shortage. We believe EV battery-makers will gradually replace current mainstream 8 ㎛ with the ultra-thin products in order to increase energy density meaningfully (Fig 2).
- **Supply to stay constrained.** Due to analogue characteristics of the manufacturing process (combination of mechanical and chemical engineering), the technological leadership of first-movers should prevail. Another reason we are excited about the competition is that Japanese suppliers, who possess a similar level of ultra-thin product technology, have been slow to add capacity. Furukawa Electric said it doesn't intend to add capacity in battery copper foil and it will focus on super high-end PCB copper foil. Another Japanese company, Nippon Denkai, under control of a private equity fund, is conservative on capex.
- **Doosan Solus (Solus) makes foray but we need to see progress.** Solus sees EV battery copper foil as its next growth engine, and is currently building a plant in Poland, where ramp up is scheduled from 3Q20. The initial capacity is 10kton p.a. (around 20% of Iljin Materials' 2020E capacity) and it should expand to 50kton p.a. by 2025E. It claims to have done pilot production of 8 ㎛ and 6 ㎛ thin copper foil, which puts it behind that of Iljin and KCFT, which are currently mass producing 6 ㎛ products. Management is confident of success in the European market, given 1) it overcame major hurdles by leveraging experience in PCB copper foil, and 2) The Poland plant is close to clients' European operations, which benefits Solus in terms of product quality (prevents corrosion during shipping) and client responsiveness.

Outlook

- We are increasingly positive on the EV battery copper foil sector. We have Outperform ratings on Iljin Materials (020150 KS) and SKC.

Analysis

Industry leaders should benefit from strong demand growth and tight supply

- We forecast EV battery copper foil demand growth of 30% CAGR during 2019-25E and expect the market to turn to supply shortage from 2020E (Fig 1). The major driver of copper foil demand is skyrocketing growth of large size battery (40% CAGR during 2019-25E based on kWh). As copper foil gradually becomes thinner in a battery, content per kWh sequentially decreases. We assume current average density is 0.6kg/kWh in small battery and 0.75kg/kWh in large size battery, which will come down to 0.5kg/kWh and 0.55kg/kWh in 2025E, respectively. Given increasing technological challenges to roll out thinner foil, our content assumption could be aggressive.

Fig 1 Battery copper foil will be seller's market throughout 2025E

	2018	2019E	2020E	2021E	2022E	2023E	2024E	2025E
COPPER FOIL DEMAND (kTon) – AxB+CxD	**121**	**177**	**266**	**345**	**510**	**605**	**736**	**810**
SMALL SIZE CYLINDRICAL BATTERY DEMAND (GWh) – A	**64**	**71**	**87**	**104**	**126**	**150**	**183**	**221**
Copper foil content (kg per kWh) – B	0.65	0.60	0.60	0.60	0.60	0.55	0.55	0.50
LARGE SIZE BATTERY DEMAND (GWh) – C	**99**	**179**	**306**	**435**	**668**	**870**	**1,059**	**1,272**
Copper foil content (kg per kWh) – D	0.80	0.75	0.70	0.65	0.65	0.60	0.60	0.55
COPPER FOIL SUPPLY (kTon)	**134**	**188**	**258**	**341**	**416**	**510**	**593**	**686**
Iljin Materials	16	26	46	56	66	86	106	126
KCFT	16	30	30	43	58	82	105	128
Furukawa Electric	10	10	10	10	10	10	10	10
Nippon Denkai	7	7	7	7	7	7	7	7
CCP	25	35	45	55	65	75	85	95
Lingbao Wason	20	30	50	70	80	90	100	110
Doosan Solus			10	20	30	40	40	50
Other	40	50	60	80	100	120	140	160

Source: SNE Research, Company data, Macquarie Research, December 2019

- Ultra-thin segment (under-6 ㎛ thickness) will likely face a severe shortage. Battery cell design and manufacturing process dictates which thickness of copper foil the battery will adopt. We believe EV battery makers will sequentially replace current mainstream 8 ㎛ with ultra-thin product, as it meaningfully increases energy density. As 6 ㎛ (0.6kg/kWh copper foil content) products have the same properties as 8 ㎛ (0.8kg/kWh), adopting it saves battery weight and leaves room for other components to fill in the battery. Therefore, the thinner the copper foil is, the more active material (cathode & anode) in a limited space, and the more energy density the battery can carry. Fig 2 shows the benefits of applying 6 ㎛ copper foil instead of the current mainstream 8 ㎛. In the same 2kg EV battery cell, cell with 6 ㎛ copper foil could contain 5.4% more active material versus cell with 8 ㎛ foil, which means the energy density can be boosted 5.4% at maximum. This affects the battery ASP, and we believe cell companies could hike ASP based on the incremental energy density. Assuming current EV battery ASP of US$150/kWh, cell makers have cause to hike their ASP by US$8 at maximum (US$8 = US$150 x energy density gain of 5.4%), in our view. We believe cell makers will be more willing to migrate from 8 ㎛ to 6 ㎛ even at a higher price.

Fig 2 Using 6㎛ copper foil makes economic sense, considering decent incremental energy density

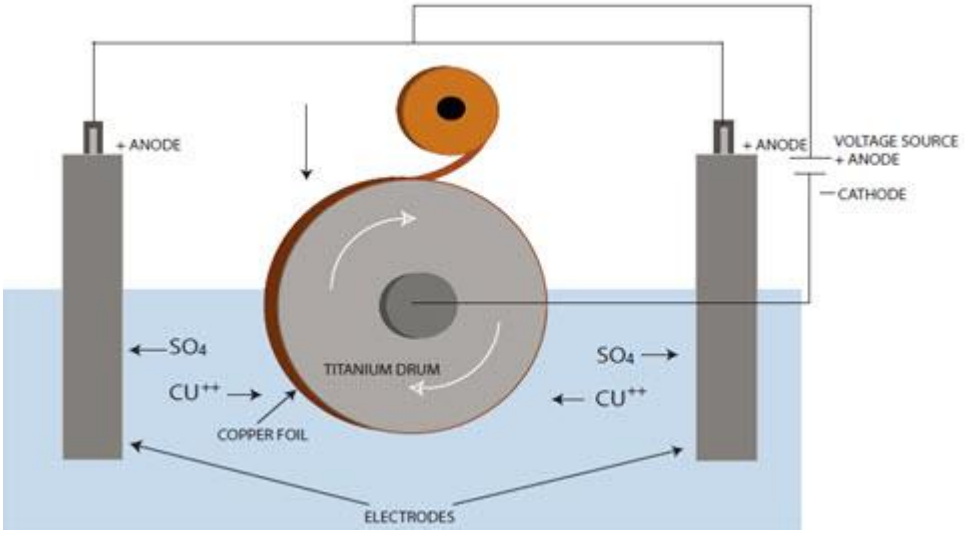
Copper foil type (thickness) **per kWh copper foil density**	**8㎛** **0.8kg**	**6㎛** **0.6kg**
Total battery cell weight (kg – A)	2	2
Copper foil weight (kg – B)	0.36	0.27
Other components weight (A-B)	1.64	1.73
% increase in active materials*		5.4%
Battery cell ASP (US$/kWh**)	150	158 = 150 x (1+5.4%)
Copper foil cost (US$/battery cell based on US$14/kg**)	5.0	?

Note: Based on SDI's EV battery cell (120Ah, 2kg), *Active materials: cathode & anode, **MQ estimates.
Source: Company data, Macquarie Research, December 2019

Supply likely to remain constrained

- Due to the analogue characteristics of the manufacturing process (combination of mechanical and chemical engineering), KCFT's technological leadership should persist in ultra-thin copper foil. KCFT is one of a few technology leaders that can roll out 6 ㎛ product at a stable production yield.
- Three technology barriers stand between mainstream 8 ㎛ product and under-6 ㎛ ultra-thin foil: 1) Across all area size, the foil's thickness has to remain uniformly under 6 ㎛, 2) As the foil becomes thinner, other features (durability, tensile strength, and elongation) deteriorates. 3) R&D and mass production is totally different level as yield issue occur in the mass production stage. A supplier's mechanical engineering capability and chemical engineering know-how are necessary to solve the difficulties stated above.
- Companies use an electrodeposition process to roll out thin copper foil. Copper is dissolved in an acid solution, and the solution is pumped into partially immersed rotating drums. The drum is electrically charged to draw copper ions. When an electric field is applied, copper is deposited on the drum as it rotates. The slower the drum speed, the thicker the copper becomes, and vice versa. After it is reeled out from the drum, foil surfaces go through chemical treatments that enhance the integrity of the foil.
- The pH of acid, voltage and RPM of drum need to be subtly controlled. Interestingly, know-how of the chemical treatment process is considered top secret among the technology leaders. It becomes highly challenging as the thickness of copper foil narrows down to 6 ㎛. The result can depend on cumulated experiment data, and the experience of the engineers matters more than equipment and written procedures in books, which makes the process hard to be copied by reverse-engineering.
- In our view, the advantage of KCFT as technology leader will continue in the foreseeable future, as the technology gap is difficult to narrow in the short term. While technology laggards are trying to catch up developing 6 ㎛ product and stabilizing the yield, KCFT recently made a breakthrough in mass production of 4 ㎛ battery copper foil.

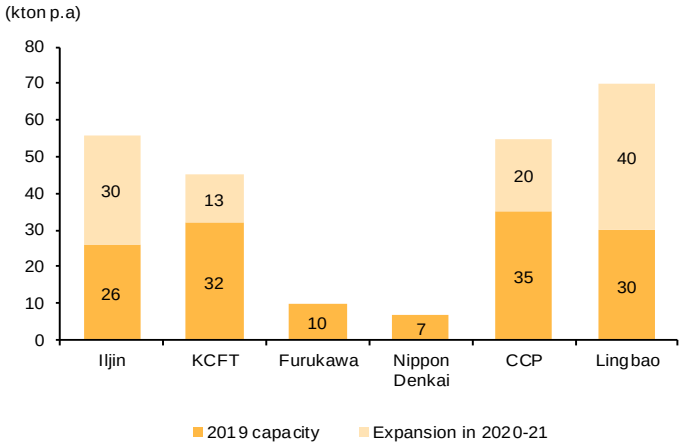
Fig 3 Thin copper foil production involves a sophisticated process



Source: Total Materia, December 2019

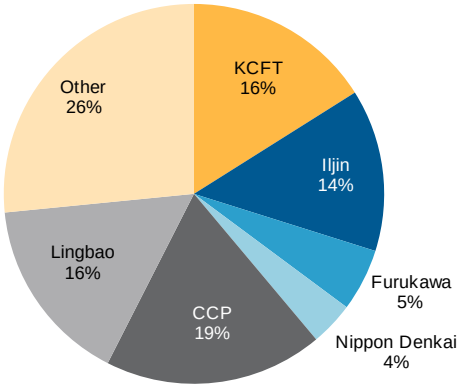
- Another reason we are excited about the competition is that Japanese suppliers, who possess a similar level of ultra-thin product technology, are reluctant to be aggressive in battery. Furukawa Electric has said it doesn't intend to add capacity in battery copper foil and it will focus on super high-end PCB copper foil. Another Japanese company, Nippon Denkai, is under the control of a private equity fund, MSD Investment, which is conservative in capex. We note that when it was under private equity control by KKR, KCFT only ever overutilized existing capacity to cope with increasing orders, rather than build new capacity.
- There are also Chinese competitors, CCP (Chang Chun Petrochemical) and Lingbao Wason, which are aggressively building new capacity. Under their growth plans, the two will exceed the capacity of Korean suppliers, KCFT and Iljin Materials, in 2021E (Fig 12). That said, their technology level is currently at the stage of stabilizing the yield of 6 μm foil and lacks a track-record outside of China.

Fig 4 Iljin and SKC (KCFT) could take advantage of Japanese players' conservative expansion



Source: Company data, Macquarie Research, December 2019

Fig 5 Global market share of copper foil (2019)

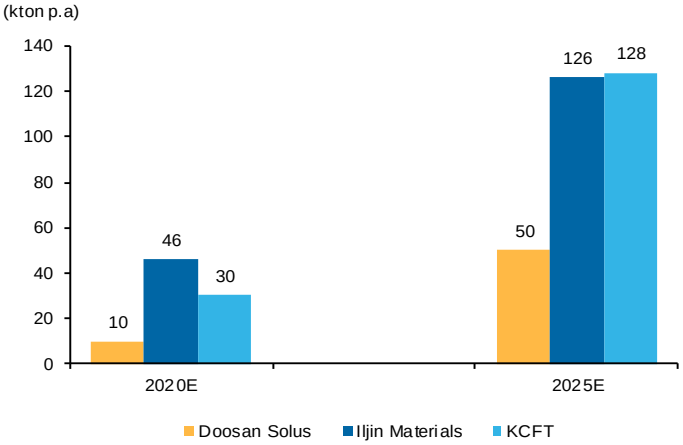


Source: Company data, Macquarie Research, December 2019

Doosan Solus (Solus) enters the market, but progress needs to be seen

- Solus sees EV battery copper foil business as its next growth engine, and is currently building a plant in Poland, where ramp-up is scheduled for 3Q20. The initial capacity is 10kton p.a. (around 20% of Iljin Materials' 2020E capacity) and it should expand to 50kton pa by 2025E. The company claims to have gone through pilot production of 8 μm and 6 μm thin copper foil, which is behind Iljin and KCFT, which are currently mass producing 6 μm products. Management is confident of success in the European market, given 1) it has overcome major hurdles by leveraging experience in PCB copper foil, and 2) The Poland plant is close to clients' European operations, which benefits Solus in terms of product quality (prevents corrosion during shipping) and client responsiveness.

Fig 6 Solus' capacity would be around 40% of the industry leaders Iljin Materials and KCFT by 2025E



Source: Company data, Macquarie Research December 2019

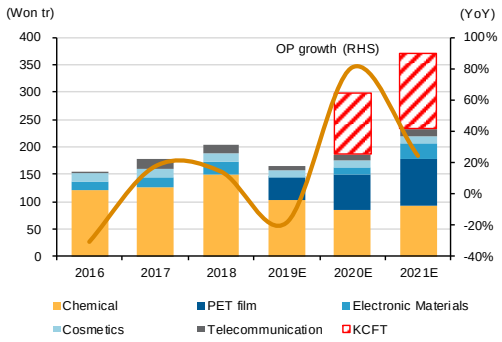
Fig 7 Solus is currently the only battery copper foil supplier with a production facility in Europe

Company	Location of production facilities
Iljin	Korea, Malaysia
SKC (KCFT)	Korea
Furukawa	Japan
Nippon Denkai	Japan
CCP	China, Taiwan
Lingbao Wason	Taiwan
Doosan Solus	Poland

Source: Company data, Macquarie Research December 2019

EQUITIES

OP growth driven by KCFT consolidation



Source: Company data, Macquarie Research, December 2019

011790 KS	Outperform
Price (at 21:03, 04 Dec 2019 GMT)	Won46,100

Valuation - Sum of Parts	Won	75,000
12-month target	Won	75,000
Upside/Downside	%	+62.7
12-month TSR	%	+64.9
GICS sector		Materials
Market cap	Wonbn	1,761
Market cap	US$m	1,507
Free float	%	53
30-day avg turnover	US$m	7.2
Number shares on issue	m	38.20

Investment fundamentals

Year end 31 Dec		2018A	2019E	2020E	2021E
Revenue	bn	2,767.8	2,519.6	3,122.1	3,585.1
EBIT	bn	201.1	164.7	297.6	370.2
EBIT growth	%	14.5	-18.1	80.6	24.4
Reported profit	bn	141.1	67.4	141.1	210.7
Adjusted profit	bn	120.6	59.8	110.2	177.3
EPS rep	Won	3,758	1,796	3,759	5,613
EPS rep growth	%	3.4	-52.2	109.3	49.3
EPS adj	Won	3,213	1,593	2,936	4,724
EPS adj growth	%	9.6	-50.4	84.3	60.9
PER rep	x	12.3	25.7	12.3	8.2
PER adj	x	14.3	28.9	15.7	9.8
Total DPS	Won	944	1,000	1,000	1,000
Total div yield	%	2.0	2.2	2.2	2.2
ROA	%	5.4	4.1	6.3	6.8
ROE	%	8.1	3.8	7.6	12.7
EV/EBITDA	x	8.2	10.2	6.7	5.5
Net debt/equity	%	75.3	80.0	99.3	92.2
P/BV	x	1.1	1.1	1.3	1.2

Source: FactSet, Macquarie Research, December 2019
(all figures in Won unless noted, TP in KRW)

Macquarie Governance and Risk Score (MGRS)
On our proprietary Governance and Risk Score SKC scores in the second quartile of our current universe coverage.

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SKC (011790 KS)
Value-enhancing transformation

Key points

- Consolidation of KCFT, a leading battery copper foil supplier, should bring in structural growth for years to come.
- Other businesses have become more stable and less cyclical.
- We initiate SKC with Outperform. Our Won75,000 TP implies 63% upside.

KCFT is worth significantly more than the acquisition price

SKC's business model has been going through a substantial change. The firm announced the acquisition of KCFT, a top-tier battery copper foil supplier, in June 2019 for Won1.2tr. We view this as a value-accretive acquisition given KCFT's decent ROIC of 20% (vs. its 5-year average of 5%). We estimate the fair value of KCFT at Won2.0tr (based on 27x 2020E P/E, same as Iljin Materials) as: 1) we believe the market is still not fully capturing upside potential of the battery copper foil business and 2) since the former owner (private equity) did not allocate any capex for expansion, growth prospects of the business have not been priced in. KCFT should enjoy a 34% top line CAGR during 2019-22E. We estimate KCFT will contribute more than 40% of SKC's OP in 2022E.

KCFT should benefit from strong demand and tight supply

We forecast an EV battery copper foil demand CAGR of 30% during 2019-25E and expect the market to see supply shortage from 2020 (Fig 9). The ultra-thin segment (under-6 ㎛ thickness) should particularly see a severe supply shortage. We believe EV battery-makers will gradually replace current mainstream 8 ㎛ with the ultra-thin products as they increase energy density meaningfully (Fig 10). Due to analogue characteristics of manufacturing process (combination of mechanical and chemical engineering), KCFT's technological leadership should sustain. We expect KCFT to enjoy strong volume growth with no margin pressure.

Core business ex-KCFT is less cyclical now

In the past, earnings of the core business were highly correlated to the commodity cycle but the cyclical part of the business has been diminishing. First, the PET film business continues to see increased non-commodity film (CPI film and other tech materials) sales. Second, the chemical business will be spun off with a 49% stake sale to PIC, Kuwaiti national oil company. Cash proceeds from the stake sale of Won536bn should reduce the financial burden.

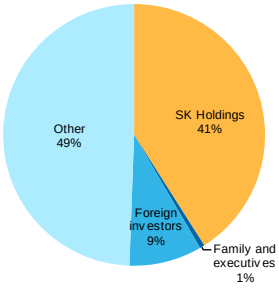
Initiate with Outperform, 63% upside

Our TP of Won75,000 is based on a sum-of-the-parts valuation (Fig 29), implying 25.5x 2020E P/E. We recommend investors to view SKC as a battery copper foil play as KCFT will consecutively be more relevant to SKC's consolidated earnings. The stock has risen 30% (vs. KOSPI index -2%) since it announced the acquisition of KCFT but we believe there is still significant upside potential given the structural advantage of battery copper foil.

SKC and Iljin are neck and neck when it comes to EV battery copper foil capacity and technology. SKC is less leveraged to battery copper foil (37% of OP in 2020E) than Iljin (86%) but is trading at a more attractive valuation (16.2x 2020E P/E vs Iljin at 24.5x).

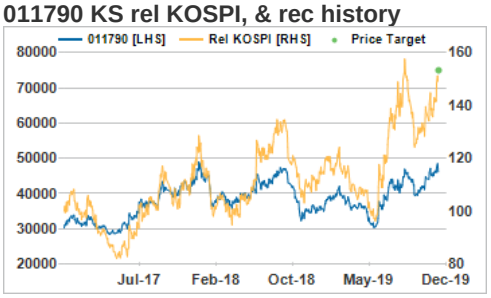
Inside

Ownership structure (as of current)



Source: Company data, December 2019

011790 KS rel KOSPI, & rec history



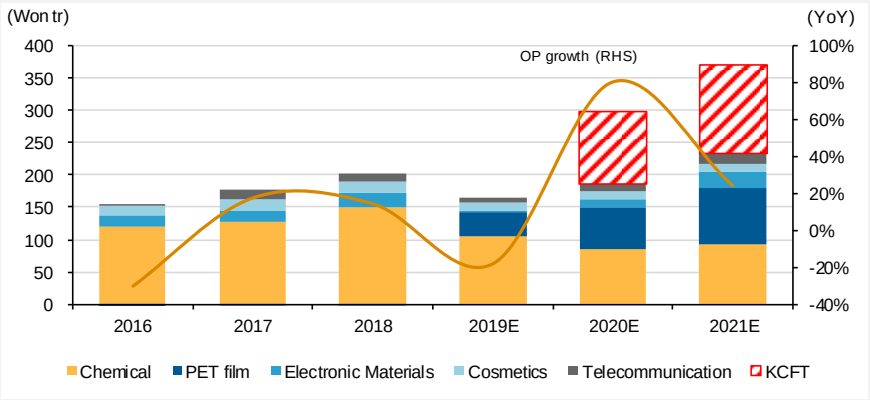
Note: Recommendation timeline - if not a continuous line, then there was no Macquarie coverage at the time or there was an embargo period.
Source: FactSet, Macquarie Research, December 2019

Look at upside in EV battery copper foil

Company profile

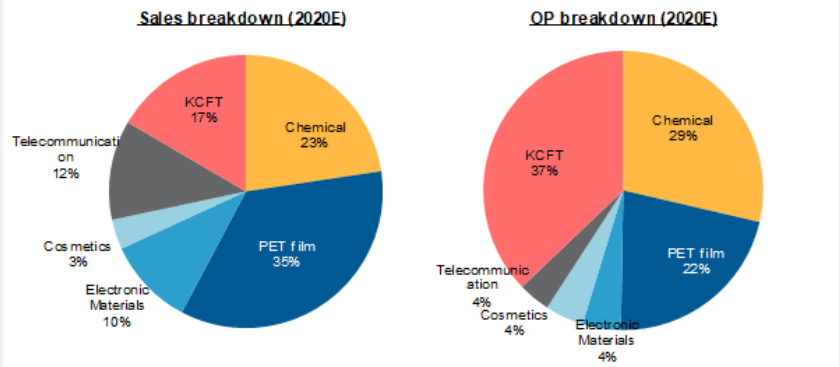
- SKC's businesses span across PET film, chemical, electronic materials, cosmetics, telecommunication, and copper foil.
- PET film (35% of consolidated sales, 22% of OP in 2020E): SKC was established as a PET film manufacturer in 1976 and later diversified its film line-up from commodity to high value-added video tape and CD-ROMs through the 1980s/1990s.
- Chemical (23% of sales, 29% of OP): The company entered PO (Polypropylene Oxide) processing in 1987 and started commercial production in 1991. The company set up a JV, MCNS, with Mitsui Chemical for production of polyurethane, downstream product of PO. In 2019, SKC has decided to spin off its chemical division and sell a 49% stake to PIC, a Kuwaiti national chemical company.
- Electronic materials (10% of sales, 4% of OP): The company acquired a controlling stake in SKC Solmics (057500 KQ) in 2008, broadening its exposure to semicon/display process chemicals.
- Cosmetics (3% of sales, 4% of OP): In 2014, SKC acquired SK Bioland, a cosmetics ingredient company, in 2014 to diversify into the biochemical industry.
- Telecommunication (12% of sales, 4% of OP): SKC acquired SK Telesys in 2001 and its main business is assembly of wireless communication antenna.
- Copper foil (17% of sales, 37% of OP): SKC announced the acquisition of KCFT, an industry leader in EV battery copper foil, for Won1.2tr. KCFT will be included in its consolidated financials in 1Q20.

Fig 1 OP growth driven by KCFT consolidation



Source: Company data, Macquarie Research, December 2019

Fig 2 Divisional sales and OP



Source: Company data, Macquarie Research, December 2019

Fig 3 Valuation table of EV battery value chain companies

Company	Code	MQ Analyst	Rec	CP (Lcy)	TP (Lcy)	Upside (%)	Mkt Cap (US$mn)	PER (x) 2020E	PER (x) 2021E	PBR (x) 2020E	PBR (x) 2021E	EPS growth (%) 2020E	EPS growth (%) 2021E	ROE (%) 2020E	ROE (%) 2021E
BATTER CELL															
Samsung SDI	006400 KS	Daniel Kim	OP	224,000	360,000	61%	13,281	11.9	8.7	1.1	1.0	134.6	36.0	9.8	12.0
LG Chem	051910 KS	Anna Park	OP	296,500	400,000	35%	19,480	13.5	11.8	1.2	1.1	162.7	14.1	9.3	9.8
SK Innovation	096770 KS	Anna Park	OP	144,000	210,000	46%	11,527	5.4	7.3	0.6	0.6	199.6	-25.5	11.9	8.3
Panasonic	6752 JP	Damian Thong	OP	1,035	1,365	32%	23,269	12.9	12.5	1.2	1.1	-34.1	3.5	9.6	9.1
CATL	300750 CH	Allen Yuan	UP	86.7	60.3	-30%	27,078	46.0	43.6	4.7	4.3	-0.7	5.6	10.7	10.2
BYD	1211 HK	Allen Yuan	UP	37.1	20.7	-44%	11,156	56.6	62.7	1.6	1.5	-6.8	-9.7	2.8	2.5
CATHODE															
- NCM -															
L&F	066970 KS	Sonny Lee	UP	18,850	15,000	-20%	393	23.2	13.0	3.0	2.4	nmf	77.7	13.9	20.7
Umicore	UMI BB		NR	39.1	NA		10,686	25.5	21.9	3.4	3.2	19.3	16.4	13.7	14.5
Shanshan	600884 CH		NR	11.6	NA		1,854	17.6	16.9	1.1	1.0	24.2	3.8	5.2	5.6
Easpring	300073 CH		NR	21.6	NA		1,336	19.0	14.9	2.4	2.1	38.5	27.3	11.5	13.6
Xiamen Tungsten	600549 CH		NR	12.2	NA		2,431	31.4	21.5	2.1	2.0	66.5	46.1	5.4	9.0
- NCA -															
Ecopro BM	247540 KS	Sonny Lee	OP	48,050	77,000	60%	874	17.4	10.3	2.5	2.0	51.0	67.8	15.6	21.7
Sumitomo Metal Mining	5713 JP	Haronobu Goroh	N	3,249	3,200	-2%	8,932	12.1	10.7	0.9	0.8	8.9	13.2	7.0	7.8
Toda Kyogo	4100 JP		NR	2,184	NA		122	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Nihon Kagaku Sangyo	4094 JP		NR	1,002	NA		190	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
ANODE															
- GRAPHITE -															
POSCO Chemical	003670 KS	Anna Park	OP	46,900	70,000	49%	2,484	22.0	17.4	2.6	2.3	14.3	26.0	12.6	14.2
Hitachi Chemical	4217 JP		NR	4,070	NA		7,790	29.2	26.3	1.9	1.8	22.7	11.1	6.7	7.2
Shanshan	600884 CH		NR	11.6	NA		1,854	17.6	16.9	1.1	1.0	24.2	3.8	5.2	5.6
Mitsubishi Chemical	4188 JP		NR	816	NA		11,288	8.4	7.5	0.8	0.7	2.3	11.5	9.9	10.4
Nippon Carbon	5302 JP		NR	4,285	NA		466	6.3	5.7	n/a	n/a	-21.5	10.9	n/a	n/a
Showa Denko	4004 JP		NR	2,917	NA		4,012	5.7	4.9	0.7	0.7	-13.8	15.3	16.0	15.8
JFE Hlds	5411 JP	Haronobu Goroh	N	1,375	1,450	5%	7,936	17.9	7.4	0.4	0.4	-73.0	140.7	2.3	5.4
- COPPER FOIL -															
Iljin Materials	020150 KS	Sonny Lee	OP	36,850	48,000	30%	1,538	22.8	14.0	2.6	2.2	44.5	63.1	12.0	17.2
SKC	011790 KS	Sonny Lee	OP	46,100	75,000	63%	1,480	15.7	9.8	1.3	1.2	84.3	60.9	7.6	12.7
Furukawa Electric	5801 JP	Haronobu Goroh	OP	2,973	3,300	11%	1,960	10.7	8.2	0.8	0.7	-33.9	29.7	7.7	9.4
SEPARATOR															
SK Innovation	096770 KS	Anna Park	OP	144,000	210,000	46%	11,527	5.4	7.3	0.6	0.6	199.6	-25.5	11.9	8.3
Asahi Kasei	3407 JP		NR	1,231	NA		15,756	12.1	11.6	1.1	1.0	1.0	4.6	9.5	9.4
Toray Industries	3402 JP	Yasuhiro Nakada	N	732	830	13%	11,019	13.3	12.5	1.0	1.0	1.8	6.8	7.8	8.2
W-Scope	6619 JP		NR	857	NA		286	15.3	5.7	1.8	1.3	154.5	171.6	11.5	27.3
Sumitomo Chemical	4005 JP		NR	496	NA		7,543	9.4	8.3	0.8	0.7	14.9	13.7	8.1	8.9
Ube Industries	4208 JP		NR	2,345	NA		2,288	8.1	7.2	0.6	0.6	8.0	12.9	8.8	9.2
ELECTROLYTE															
Soulbrain	036830 KS	Sonny Lee	N	70,000	83,000	19%	1,026	8.3	7.5	1.2	1.1	-0.1	11.1	15.8	15.2
Chunbo	278280 KS		NR	51,600	NA		432	13.6	9.9	2.4	1.9	58.3	36.4	20.2	22.2
Mitsubishi Chemical	4188 JP		NR	816	NA		11,288	8.4	7.5	0.8	0.7	2.3	11.5	9.9	10.4
Shenzhen Capchem	300037 CH		NR	29.9	NA		1,607	24.5	19.2	3.2	2.8	25.2	27.7	13.0	14.6
Ube Industries	4208 JP		NR	2,345	NA		2,288	8.1	7.2	0.6	0.6	8.0	12.9	8.8	9.2
Guangzhou Tinci	002709 CH		NR	17.5	NA		1,359	23.2	18.0	3.1	2.8	65.3	29.0	7.0	13.4
Mitsui Chemical	4183 JP		NR	2,602	NA		4,890	8.6	7.8	0.8	0.8	25.6	10.2	10.7	10.4

Note: Share prices as of Dec 4, 2019. Source: Company data, Macquarie Research, December 2019

KCFT is worth significantly more than the acquisition price

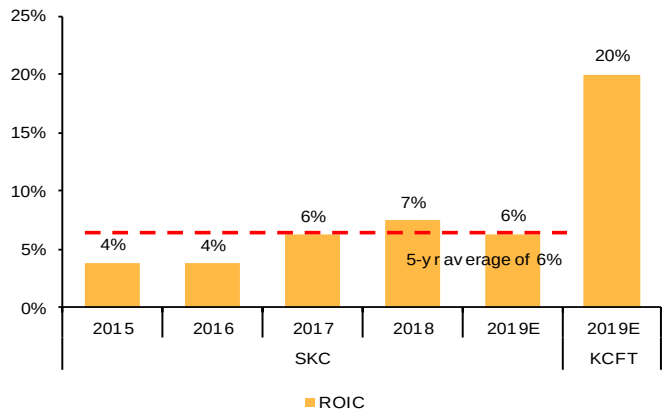
SKC is going through a substantial change of business model. In June 2019, the firm announced the acquisition of KCFT, a top-tier battery copper foil supplier, for Won1.2tr. We view this as a value-accretive acquisition, given KCFT's decent ROIC of 20% (vs its past 5-year average of 5%). We estimate the fair value of KCFT at Won2.0tr (based on 27x 2020E P/E, same multiple of Iljin Materials): 1) We believe the market is still not fully capturing upside potential of the battery copper foil business, and 2) since the former owner (private equity) did not allocate capex to expand the business, growth prospects of the business have not been priced in. We will elaborate this through pages 6 to 8, while providing details in this section.

We calculate battery copper foil business' ROIC at 20%, which is very attractive. However, the business is capital intensive since it requires at least Won120bn capex a year (based on typical line size of 10kton p.a. capacity). Management needs to show patience as it takes more than a year for new capacity to reach full capacity. Qualification process usually takes no less than six months and due to its analogue features of manufacturing process (combination of mechanical and chemical engineering, page 7), it would take more time to optimise the new production line.

SKC is aware of the nature of battery copper foil business and aims to grow the business from a long-term perspective. SKC sold its stake in the chemical business and SKC Kolon PI (polyimide film JV) in order reallocate its resources to KCFT. SKC's long-term plan is to clock a 25% CAGR in KCFT capacity during 2019-25E, and to expand topline at a similar pace.

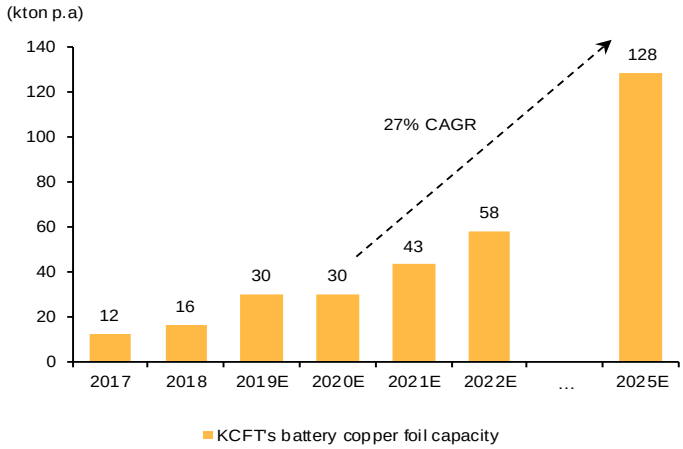
KCFT already serves five global EV battery cell-makers (LG Chem, SDI, Panasonic, CATL, and SK Innovation). Since the company was part of a larger LG Group (LS Automotive) before the takeover by a private equity, LG Chem accounts for 50% of sales. Although tensions have been aggravating between SK and LG Group, we rule out the possibility of sudden order cuts from LG Chem, given strong relationship (it has been LG Chem's copper foil vendor since the beginning) and supply shortage. In addition, its affiliate SK Innovation's volumes should rise further.

Fig 4 KCFT's ROIC of 20% is far ahead of SKC's existing business' ROIC



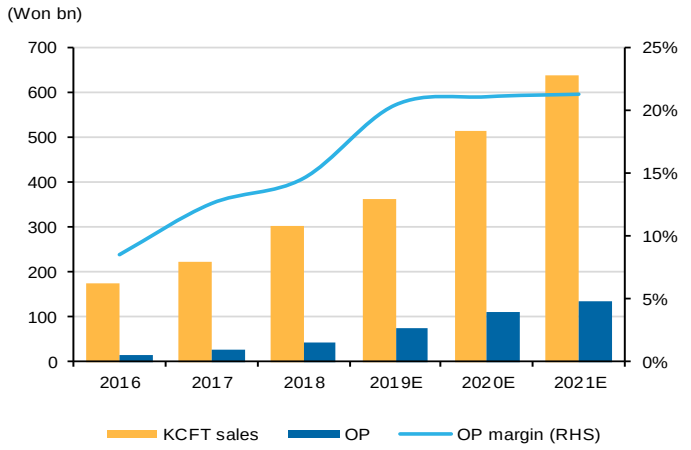
Source: Company data, Macquarie Research, December 2019

Fig 5 Long-term plan for capacity expansion at KCFT



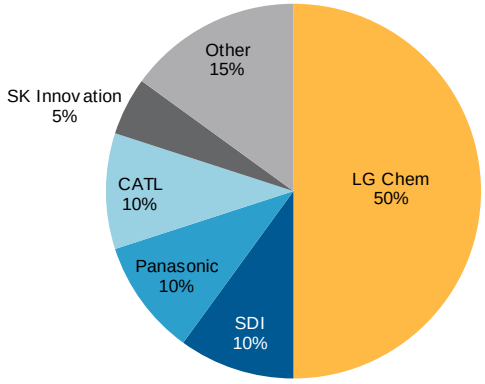
Source: Company data, Macquarie Research, December 2019

Fig 6 Sales to double during 2019-21E, with stable OPM



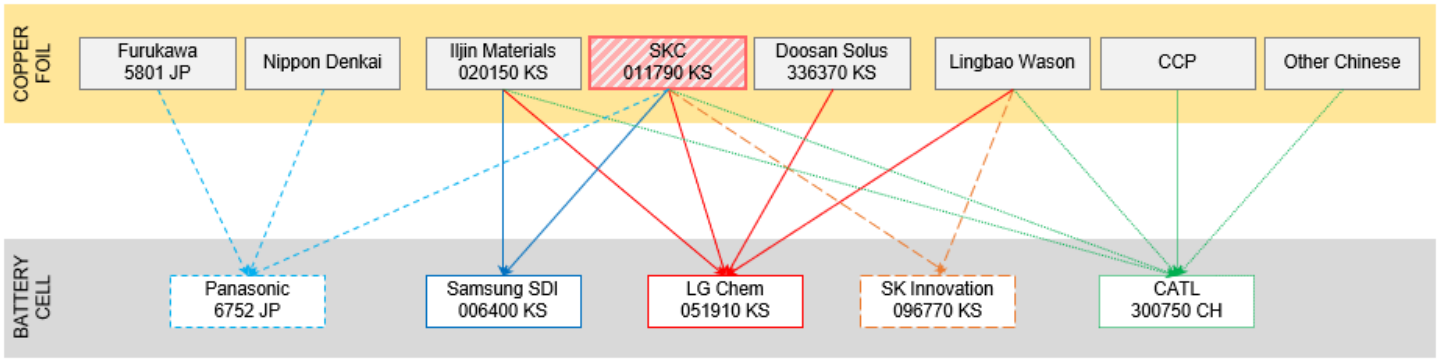
Source: Company data, Macquarie Research, December 2019

Fig 7 Sales breakdown by client (2019)



Source: Company data, Macquarie Research, December 2019

Fig 8 KCFT has the most diversified client portfolio, serving all the global battery cell-makers



Source: Company data, Macquarie Research, December 2019

Strong demand and tight supply

We forecast an EV battery copper foil demand CAGR of 30% during 2019-25E and expect the market to see supply shortage from 2020E (Fig 9). The major driver of copper foil demand is skyrocketing growth of large-sized battery (40% CAGR during 2019-25E based on kWh). As copper foil in a battery becomes thinner gradually, content per kWh decreases steadily. We assume the current average density is 0.6kg/kWh in small battery and 0.75kg/kWh in large-sized battery, which should come down to 0.5kg/kWh and 0.55kg/kWh in 2025E, respectively. Given the increasing technological challenges to roll out thinner foil, our content assumption could be aggressive.

Fig 9 Battery copper foil – a suppliers' market through 2025E

	2018	2019E	2020E	2021E	2022E	2023E	2024E	2025E
COPPER FOIL DEMAND (kTon) – AxB+CxD	**121**	**177**	**266**	**345**	**510**	**605**	**736**	**810**
SMALL SIZE CYLINDRICAL BATTERY DEMAND (GWh) – A	**64**	**71**	**87**	**104**	**126**	**150**	**183**	**221**
Copper foil content (kg per kWh) – B	0.65	0.60	0.60	0.60	0.60	0.55	0.55	0.50
LARGE SIZE BATTERY DEMAND (GWh) – C	**99**	**179**	**306**	**435**	**668**	**870**	**1,059**	**1,272**
Copper foil content (kg per kWh) – D	0.80	0.75	0.70	0.65	0.65	0.60	0.60	0.55
COPPER FOIL SUPPLY (kTon)	**134**	**188**	**258**	**341**	**416**	**510**	**593**	**686**
Iljin Materials	16	26	46	56	66	86	106	126
KCFT	16	30	30	43	58	82	105	128
Furukawa Electric	10	10	10	10	10	10	10	10
Nippon Denkai	7	7	7	7	7	7	7	7
CCP	25	35	45	55	65	75	85	95
Lingbao Wason	20	30	50	70	80	90	100	110
Doosan Solus			10	20	30	40	40	50
Other	40	50	60	80	100	120	140	160

Source: SNE Research, Company data, Macquarie Research, December 2019

The ultra-thin segment (under-6 ㎛ thickness) should particularly face severe shortage. Battery cell design and manufacturing process dictates the thickness of copper foil used in a battery. We believe EV battery makers will gradually replace the current mainstream 8 ㎛ with the ultra-thin products as they increase energy density meaningfully. As 6 ㎛ (0.6kg/kWh copper foil content) products have the same property as 8 ㎛ (0.8kg/kWh) ones, it reduces battery weight or creates space for other components. Therefore, the thinner the copper foil is, the more active material (cathode & anode) in a limited space, and the more energy density the battery could carry. Fig 10 shows the benefit of adopting 6 ㎛ copper foil instead of the current mainstream 8 ㎛. In a 2kg EV battery cell, 6 ㎛ copper foil could contain 5.4% more active material versus 8 ㎛ foil, which means the energy density could be boosted by 5.4% maximum. This affects the battery ASP, and we believe the cell companies could raise ASPs based on the incremental energy density. Assuming current EV battery ASP of US$150/kWh, cell-makers have a good reason to increase their ASP by US$8 at maximum (US$8 = US$150 x energy density gain of 5.4%). We believe cell-makers are willing to migrate from 8 ㎛ to 6 ㎛ even if it means a higher price.

Fig 10 Using 6㎛ copper foil makes economic sense, considering decent incremental energy density

Copper foil type (thickness) per kWh copper foil density	**8㎛ 0.8kg**	**6㎛ 0.6kg**
Total battery cell weight (kg – A)	2	2
Copper foil weight (kg – B)	0.36	0.27
Other components weight (A-B)	1.64	1.73
% increase in active materials*		5.4%
Battery cell ASP (US$/kWh**)	150	158 = 150 x (1+5.4%)
Copper foil cost (US$/battery cell based on US$14/kg**)	5.0	?

Note: Based on SDI's EV battery cell (120Ah, 2kg), *Active materials: cathode & anode, **MQ estimates.
Source: Company data, Macquarie Research, December 2019

Due to the analogue characteristics of its manufacturing process (combination of mechanical and chemical engineering), KCFT's technological leadership should sustain in the ultra-thin copper foil. KCFT is one of the technology leaders who could roll out 6 ㎛ product at a stable production yield.

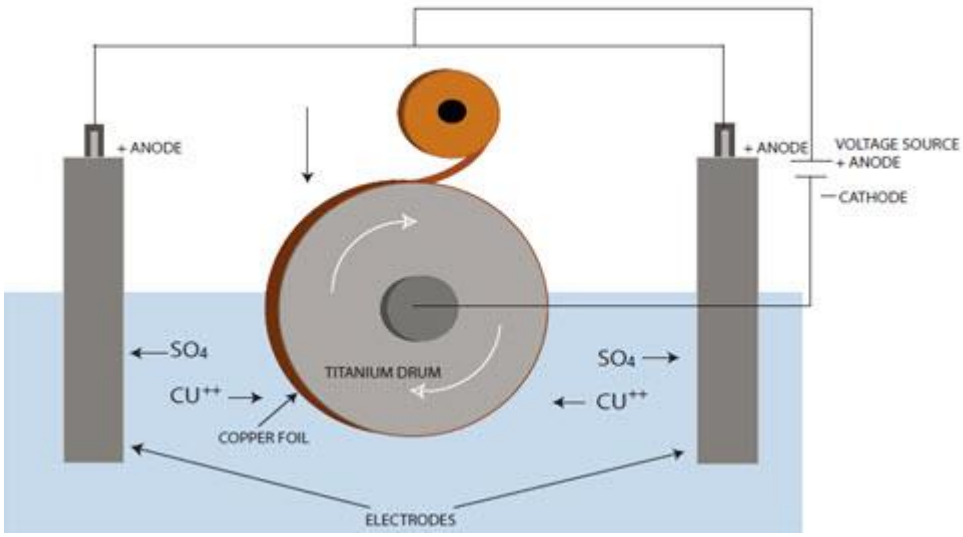
Three technology barriers stand between mainstream 8 ㎛ product and under-6 ㎛ ultra-thin foil: 1) across all area sizes, the foil's thickness has to uniformly remain under 6 ㎛; 2) as the foil becomes thinner, other features (durability, tensile strength, and elongation) deteriorate; and, 3) it takes a bit of time from R&D through mass production as the yield issue occurs at the mass production stage. Supplier's mechanical engineering capability and chemical engineering know-how are deeply intertwined in solving the difficulties stated above.

Companies use electrodeposition process to roll out thin copper foil. Copper is dissolved in an acid solution, and the solution is pumped into partially immersed rotating drums. The drum is electrically charged to draw copper ion. When an electric field is applied, copper is deposited on the drum as it rotates. The slower the drum speed, the thicker the copper becomes, and vice versa. After reeled out from the drum, foil surfaces go through chemical treatments that enhance integrity of the foil.

The pH of acid, voltage and RPM of drum need to be controlled subtly. Especially, know-how of the chemical treatment process is considered top secret of the technology leaders. It becomes highly challenging as thickness of copper foil narrows down to 6 ㎛. It depends on cumulated experiment data, and the experience of engineers matters more than equipment and written procedures in books, which makes the manufacturing process hard to be copied by reverse-engineering.

In our view, advantage of KCFT as a technology leader will sustain in the foreseeable future, as the technology gap is hard to be narrowed in a short term. While technology laggards are trying to catch up developing 6 ㎛ product and stabilizing the yield, KCFT recently made a breakthrough in mass production of 4 ㎛ battery copper foil.

Fig 11 Thin copper foil production involves sophisticated process

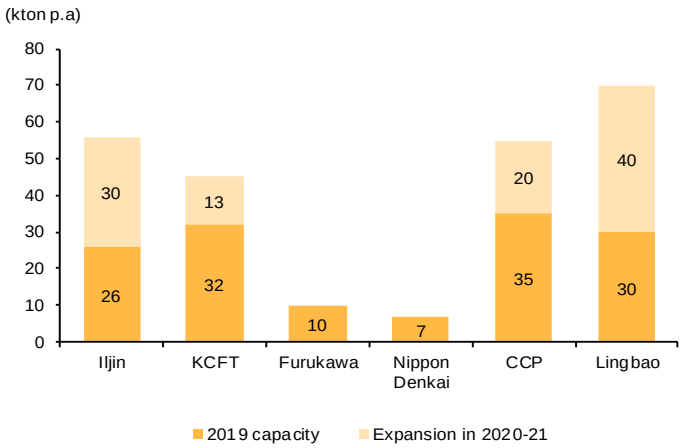


Source: Total Materia, December 2019

One more reason we are excited about the competition is that Japanese suppliers, who possess similar level of ultra-thin product technology, are reluctant to be aggressive in battery. Furukawa Electric announced that they don't have intention to add capacity in battery copper foil and will focus on super high-end PCB copper foil. Another Japanese company, Nippon Denkai, is under control of a private equity fund, MSD Investment, which is not in a situation to make capex decision. We remind that under the private equity, KKR, KCFT only overutilized existing capacity to cope with increasing orders rather than building new capacity.

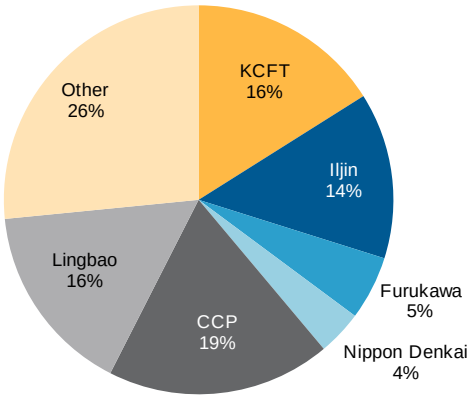
There are Chinese competitors, CCP (Chang Chun Petrochemical) and Lingbao Wason, who are aggressively building new capacity. According to their expansion schedules, the two will outweigh the capacity of Korean suppliers, KCFT and Iljin Materials, in 2021E (Fig 12). That said, their technology is at the stage of stabilizing the yield of 6 ㎛ foil and lacks track record outside of China.

Fig 12 KCFT could take advantage from Japanese players' conservative expansion



Source: Company data, Macquarie Research, December 2019

Fig 13 Global market share of copper foil (2019)



Source: Company data, Macquarie Research, December 2019

Core business ex-KCFT has become less cyclical

PET film business to diversify away from commodity film

SKC has grown the PET film business since the beginning. Although its contribution has diminished during the business diversification, we still expect it to generate 35% of consolidated sales and 21% of OP in 2020E. We have a positive outlook on SKC's PET film business for three reasons: 1) improving product mix, 2) widening PET spread (thanks to downward feedstock prices), and 3) restructuring of problem business.

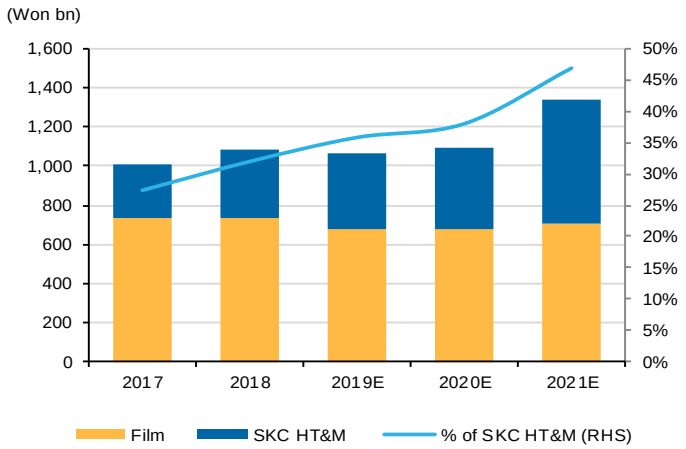
PET film business' product mix is improving as high-end film's sales portion continues to rise from 20% three years ago to 40% currently. Its internal coating business arm, SKC ht&m (high tech & marketing)'s sales continue to inch up, now accounting for 36% of the division sales. This enables SKC to climb up the value ladder as the coating process upgrades the film's features to serve tech industries, such as FCCL (Flexible Copper Clad Laminate), ITO (Indium Tin Oxide) film, and CPI hard-coating film.

The company is growing CPI (Colourless Polyimide) film business for its future applications in foldable/rollable display. CPI film is currently applied to foldable phone's cover, replacing the cover glass in the conventional mobile panels (Fig 16). It needs to deliver a glass-like transparency, while maintaining integrity after thousands of foldings. It needs PET base-film extraction (different from commodity type film) and delicate PSA (Pressure Sensitive Adhesive) coating technology.

We note that there is ongoing controversy whether CPI film or UTG (Ultra-Thin Glass) would take the lead in foldable display's cover glass. While CPI film possess better flexibility (curvature ratio of 1mm) and thinner form factor (~220 ㎛), UTG boasts transparency and crease-proof characteristic (Fig 17). IHS believes the two technologies will co-exist for mobile application. For mobile only, IHS expects CPI film market for mobile to grow from 240k m² in 2019 (equivalent to 10-12mn foldable phone unit, without consideration of poor production yield at the beginning) to 600k m² in 2023E (24-30mn unit). If we include large-sized foldable/rollable panels, there would be ample growth opportunity in the CPI film business.

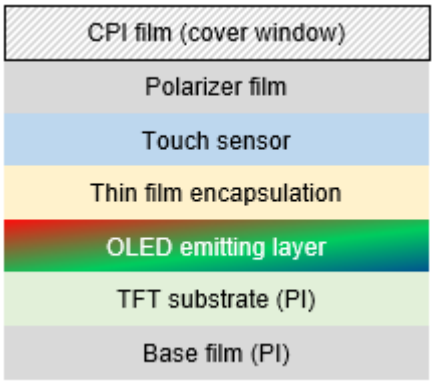
SKC's management has guided for production in late 2020/early 2021 from fully integrated production lines, which manage both PET film and adhesive coating. They are not expediting the schedule as they expect a widespread adoption of foldable display from 2021. Management is confident about the product quality since the company possesses technologies of both PET film and coating, while the first movers (Sumitomo, Kolon Industries) are specialized in only one of the processes and outsource the other. The initial capacity of the CPI line will be around 1mn m², which will be neck-and-neck with Kolon Industries' current capacity. We baked Won20bn of 2021E sales contribution from the CPI business in our model, referring to Kolon Industry's first year CPI sales (2019). However, we expect sales growth to be explosive in the following years, considering its size of capacity and steep learning curve as a fast follower.

Fig 14 High value-added coated film sales rising



Source: Company data, Macquarie Research, December 2019

Fig 15 CPI film in foldable phone



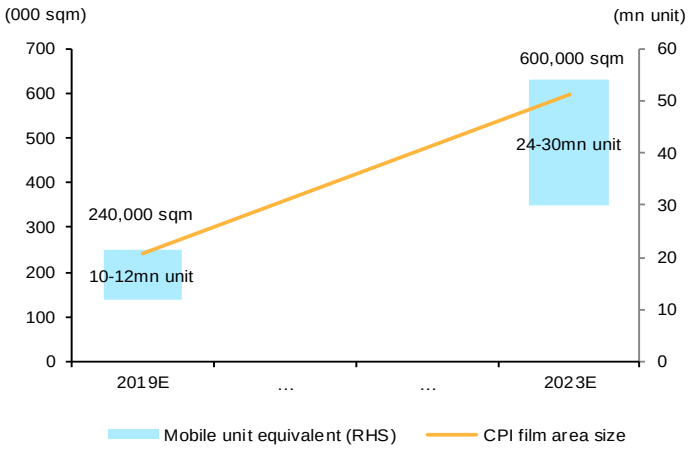
Source: Macquarie Research, December 2019

Fig 16 CPI vs UTG

	CPI Film	Ultra-Thin Glass
Flexibility (curvature)	1mm	2-3mm
Thickness (incl. protection layers)	~220 ㎛	~270 ㎛
Transparency		Better
Scratch-proof		Better
Crease-proof		Better

Source: Macquarie Research, December 2019

Fig 17 CPI film's mobile adoption should keep rising



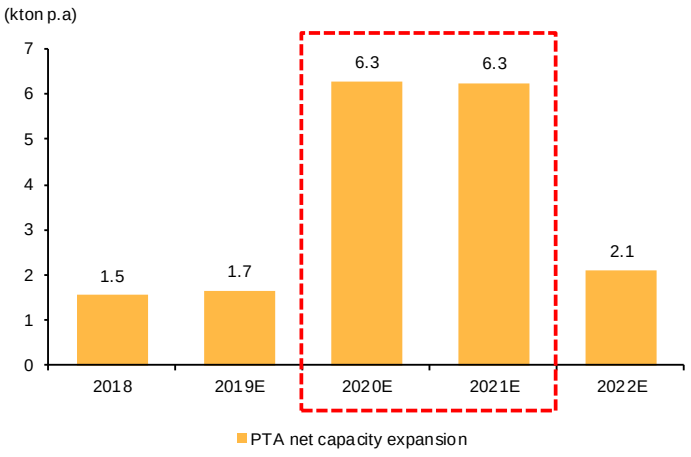
Source: IHS, Macquarie Research, December 2019

Other positives in PET film: Lower feedstock price + free from restructuring charges

PET, main ingredient of SKC's film products, is the composition of two commodity chemical products, PTA and MEG. Price of PTA, which accounts for 75% of the material input cost, will be under pressure thanks to massive new capacity coming on stream in the next two years. Combined net addition of the capacities will amount to 12.6mn ton p.a., which is 13% of the current global capacity.

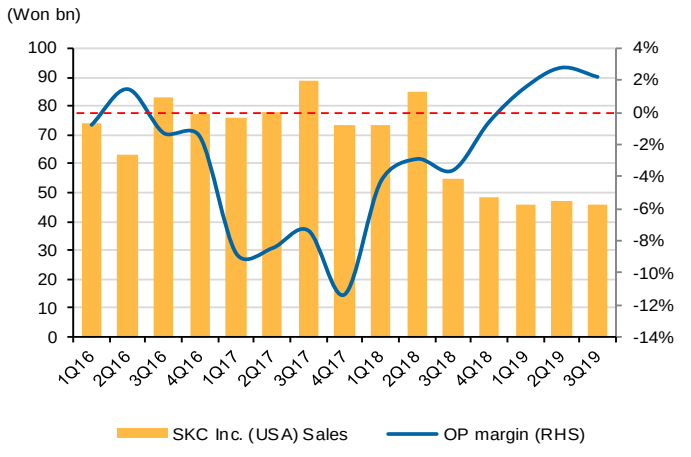
PET film business' earnings will be no longer dragged down by the solar panel film business. SKC Inc. USA, which had focused on the solar panel film business, posted chronic losses from 2015 and the company decided to shut down the business in 2017. The aftermath of restructuring affected earnings until 2018, before the company turned to profit in 1Q19. Based on global weakness in feedstock prices and continued efforts to improve the product mix, we expect the subsidiary to remain profitable down the road.

Fig 18 PTA will face an oversupply situation



Source: S-OIL, Macquarie Research, December 2019

Fig 19 Turnaround of SKC Inc. (USA), after fixing problem in the solar panel film business



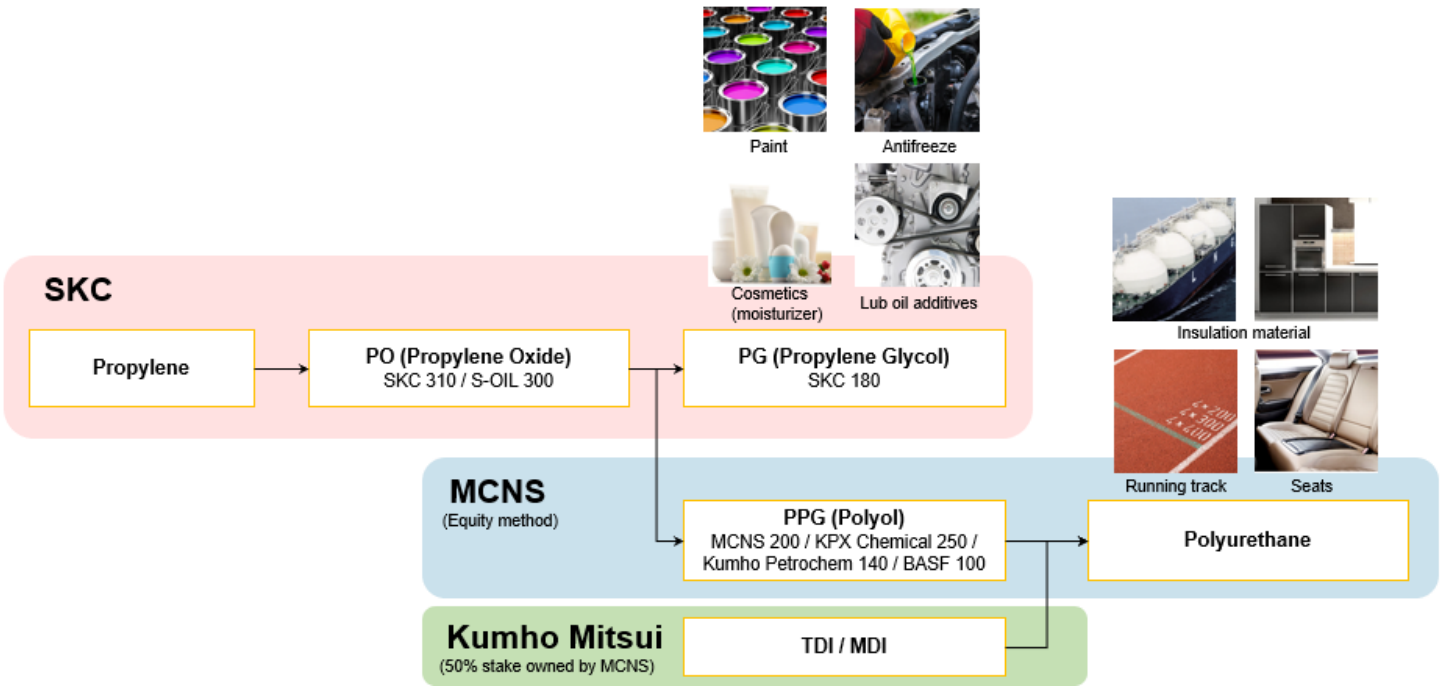
Source: Company data, Macquarie Research, December 2019

Selling 50% stake in the cyclical chemical business

The chemical business has been SKC's cash cow business for decades. Main products are PO (Propylene Oxide) and its downstream products. PO, processed from propylene, is an upstream product of PG (Propylene Glycol) and PPG (Polyol). The derivatives are main ingredients of diverse downstream products such as synthetic resin, antifreeze, cosmetics, lubricants, and polyurethane (Fig 21). SKC currently runs 310kton (per annum) of PO process line and 180kton of PG line. They are connected to 200kton PPG process line, which is operated by the JV, MCNS (Mitsui Chemical & SKC), profit of which is recognized as SKC's equity method income.

Fig 20 Korea PO value chain

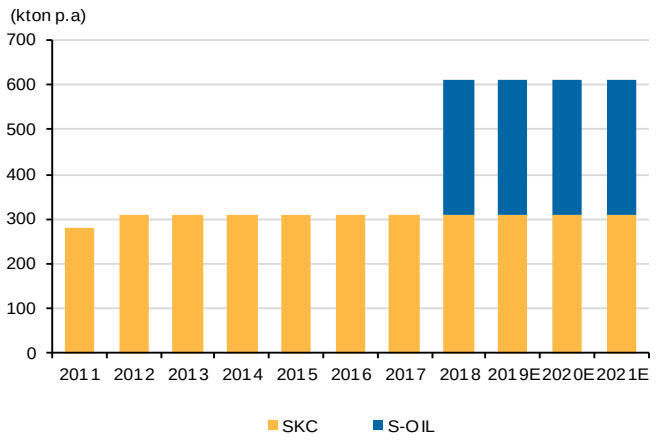
(Unit: kton per annum)



Source: Company data, Macquarie Research, December 2019

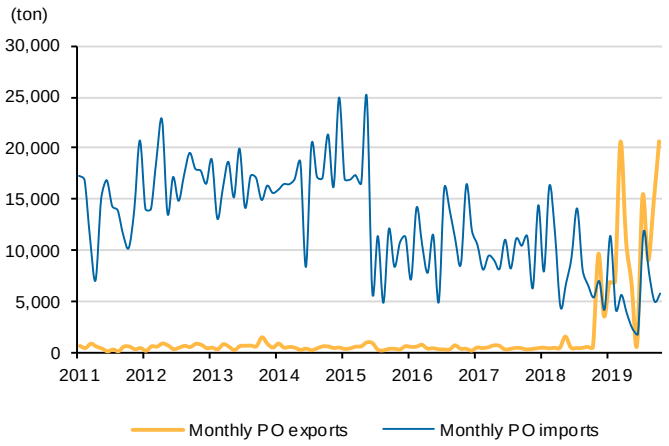
SKC had a virtual monopoly over PO (Propylene Oxide) supply chain in Korea until the larger hometown rival, S-OIL, broke into the value chain in 2018. Korea's total PO capacity doubled to 610kton p.a. by the entrance of S-OIL, which started to utilize 300kton capacity from 2019. Korea has become a net exporter of PO in 2019, and PO export prices have fallen more than 40% from the recent peak, indicating negative impact for SKC's PO pricing. Accordingly, PO/propylene spread quickly narrowed to a 10-year low US$0.3/kg level, and it drove the PG/propylene spread down to near US$0.5/kg. The decent high teen OP margin of the chemical business contracted to 13% in 3Q19 as the spread deteriorated rapidly. We expect the OP margin to stay at the current low-teen level given S-OIL's capacity is being fully utilised and downstream product demand from diverse industries is steady.

Fig 21 Korea's PO supply chain disrupted by S-OIL



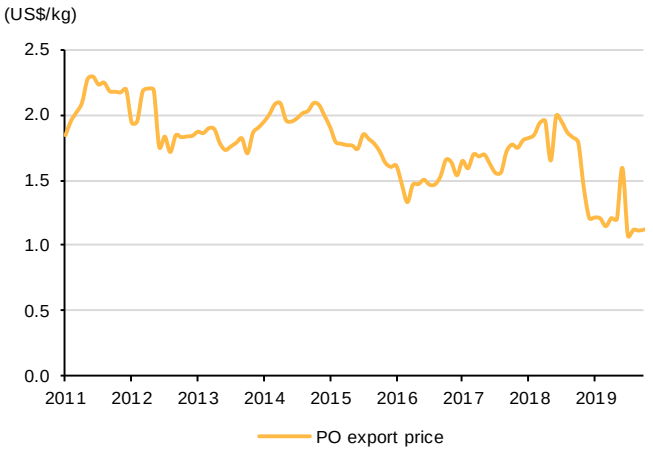
Source: Company data, Macquarie Research, December 2019

Fig 22 Korea has become a net exporter of PO



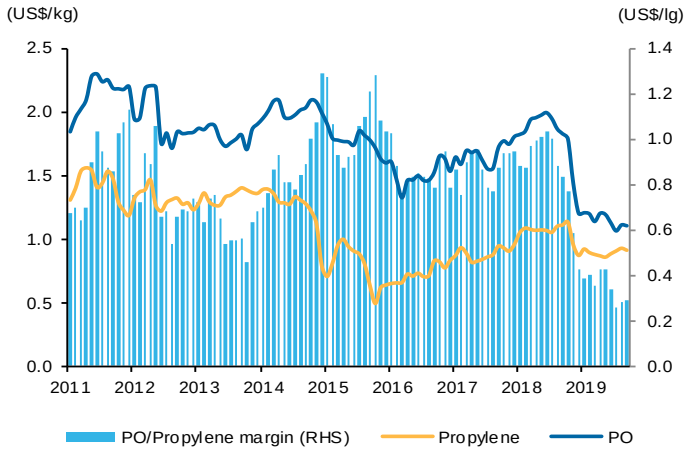
Source: Company data, Macquarie Research, December 2019

Fig 23 Korea's PO prices near 10-year low



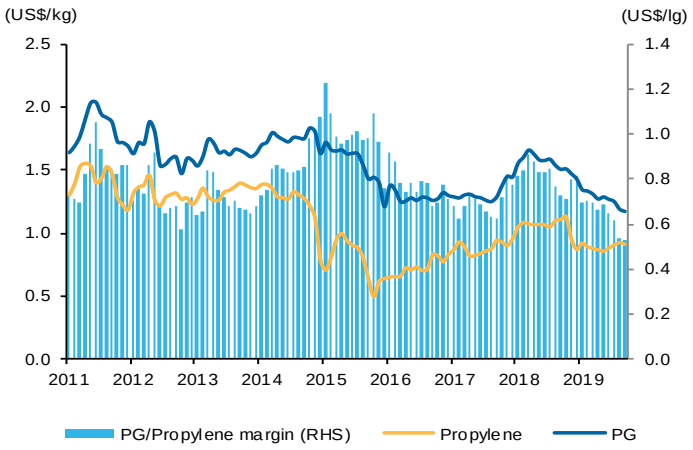
Source: Company data, Macquarie Research, December 2019

Fig 24 Due to PO/Propylene spread erosion…



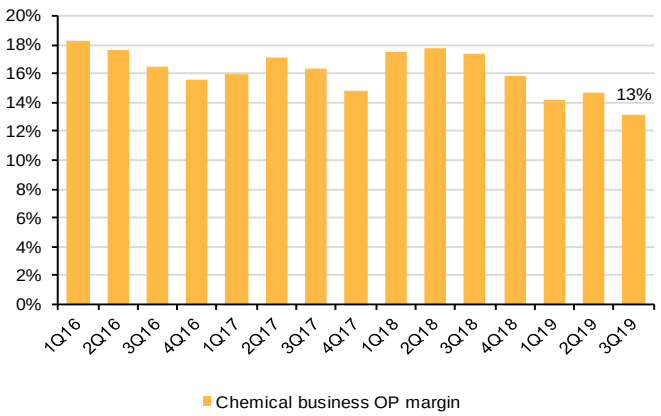
Source: Cischem, Macquarie Research, December 2019

Fig 25 … PG/Propylene spread narrowed



Source: Cischem, Macquarie Research, December 2019

Fig 26 Chemical business OP margin is coming off



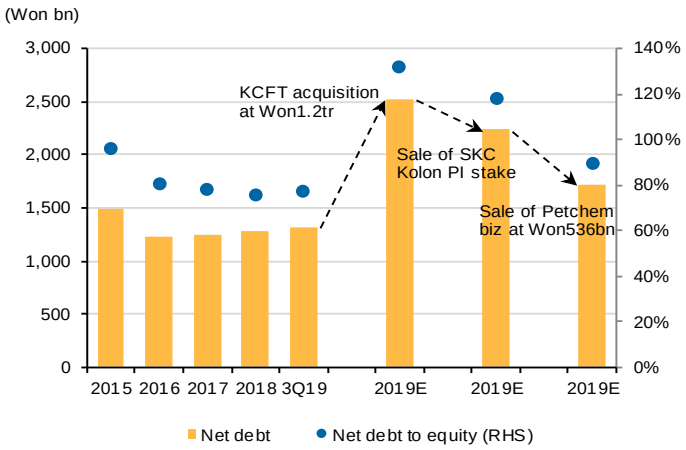
Source: Company data, Macquarie Research, December 2019

While the chemical business is becoming less attractive, SKC announced a spin-off and sale of a 49% stake in its chemical business in August 2019 for Won536bn to PIC, Kuwaiti national oil company. We believe this is a sensible move, given heightened financial leverage and a bleak PO business outlook. The company's net debt is expected to swell to Won2.5tr (130% net D/E ratio) after the KCFT acquisition, and the decision to spin off its chemical business, valued at 9x 2020E EV/EBITDA, doesn't look like a hasty one.

SKC's current net debt of Won1.3tr (3Q19) will tip Won2.5tr cash payment for the KCFT acquisition. Further, SKC decided to sell SKC Kolon PI (market cap of Won1.0tr, 27% ownership), which would bring down the net debt to Won2.2tr, assuming it sells at the current market value. With the sale of a 49% stake in the chemical business, SKC will receive cash proceeds of Won536bn, which will further lower net debt to Won1.7tr. We expect SKC's net debt to equity ratio to be around 90% after all this is done. Since the company has maintained its net debt to equity ratio at around 80% over the past couple of years, a 90% ratio would be manageable.

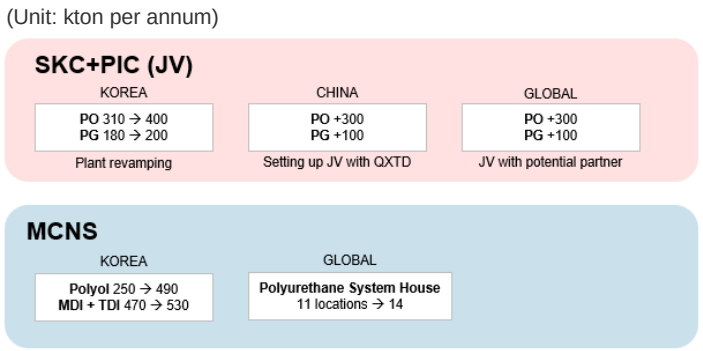
Despite selling half of its stake, we estimate the chemical business will still take up 30% of 2020E net profit (including the equity method income). The expansion of PO business will be aggressive in collaboration with PIC, given PIC's strategy to gain global presence in the petrochemical value chain. According to the company's long-term guidance, its combined PO/PG capacity should reach 1mn ton/400kton p.a by 2025E. MCNS, its JV with Mitsui Chemical, will double its PPG capacity at the same time, and continue to invest in polyurethane system houses around the world. Financial burden for the expansion, however, would be limited as it will expand by setting up JVs.

Fig 27 Net debt mitigated by the sale of chemical business



Source: Company data, Macquarie Research, December 2019

Fig 28 Long-term business plan through 2025E, in collaboration with PIC



Source: Company data, Macquarie Research, December 2019

Valuation, recommendation, risks

Valuation and recommendation

We initiate coverage on SKC with an Outperform rating and a target price of Won75,000. Our target price implies 63% upside from the current share price.

Fig 29 SKC's SOTP valuation table

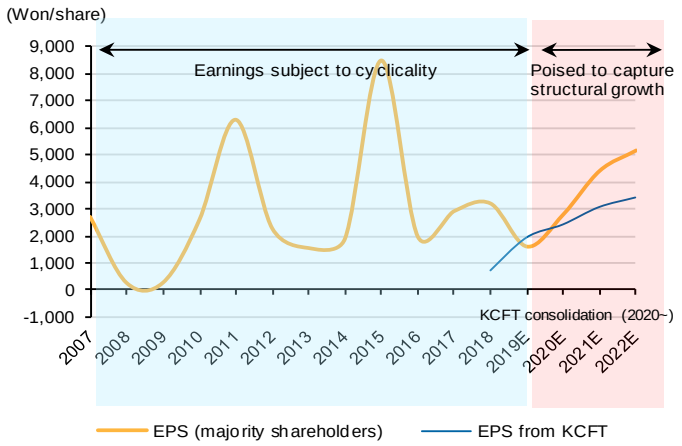
(Won bn)	Fair value	Ownership	Listed Co. Market cap	Book value BV (2Q19)	P/E valuation (2020E) NP	P/E (x)	Note (peer)
[PER]							
KCFT	1,966				73	27	Iljin Materials
Chemical	189	51%			53	7	KPX Chemical, Kumho Petrochem
Industry materials (PET film)	298				33	9	Kolon Industries
Electronic materials	38	69%*			6	10	SK Materials
Telecommunication (SK Telesys)	27	79%			3	10	Solid
[Listed Co.: mark-to-market]							
Cosmetics (SK Bioland)	58	28%	298				Listed, 30% discount
[Book value]							
Chemical (MCNS)	241	50%		481			
Fair value (Won bn)	**2,818**						
No. of shares	37,534,555						
Target price (Won/share)	**75,000**						
Current price	47,650						
Upside	57%						

Note: Interest expenses are allocated to each division, proportionally to the amount of sales. *Average % shareholding of SK Telesys and SKC Solmics
Source: Company data, Macquarie Research, December 2019

Our target price of Won75,000 is based on a SOTP valuation. The target price implies 25.5x 2020E P/E. SKC is trading at 16.2x/10.1x 2020/21E EPS, and the multiple will drop steadily due to strong earnings growth driven by KCFT (capacity expansion), and PET film business (margin expansion).

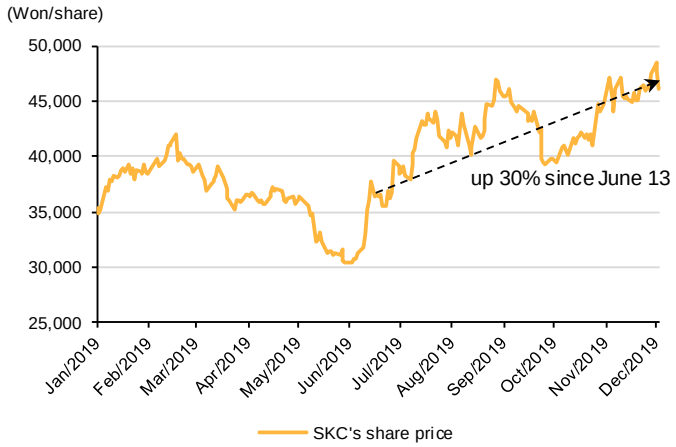
SKC's earnings have been very unstable bound by the chemical cycle. However, with the consolidation of KCFT in 2020E, earnings should enjoy structural growth with much less volatility. The stock is up 30% since the company announced the acquisition of KCFT, but we believe it is still a good timing to ride on structural upside of battery copper foil.

Fig 30 SKC is poised to capture structural growth after the KCFT consolidation



Source: Bloomberg, Macquarie Research, December 2019

Fig 31 The stock is up 30% since the announcement of the KCFT acquisition



Source: Bloomberg, Macquarie Research, December 2019

We believe KCFT and Iljin are neck and neck when it comes to battery copper foil capacity and technology. Both will continue client diversification, as Iljin is gaining vendor share in LG Chem, while KCFT will take more volumes from the affiliate, SK Innovation. We expect both to gain market share in CATL, as the Chinese market leader plans to expand to the European market and spec up the battery to meet higher standards of global auto OEMs.

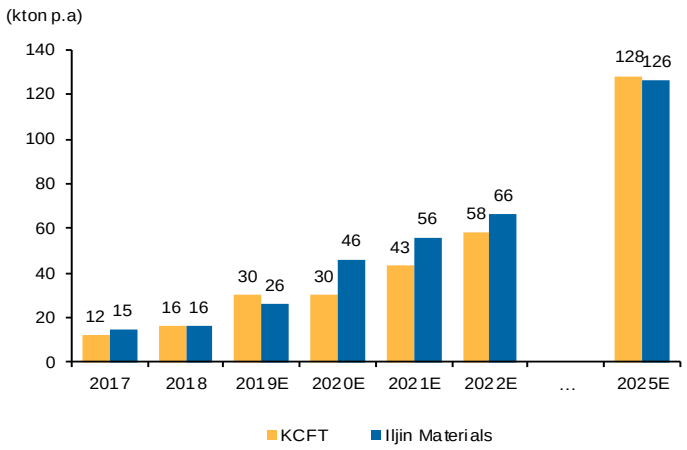
Indeed, SKC is less leveraged to battery copper foil (37% of OP from battery copper foil in 2020E) than Iljin (86%) but is trading at a more attractive valuation (16.2x 2020E P/E vs Iljin at 24.5x). We recommend investors to view SKC as a battery copper foil play as its future investment plan is to grow KCFT. We expect around Won1.2tr of capex to be allocated to grow KCFT until 2025E, while the investment in other business would be controlled (CPI) or progressed by JV, which would put less burden on SKC. KCFT will be more relevant to SKC's consolidated earnings as its sales volume will grow 3x until 2025E, generating higher than overall OP margin.

Fig 32 SKC vs Iljin Materials

	SKC	Iljin Materials
Battery copper foil out of total OP		
2020E	37%	86%
2021E	37%	91%
2022E	41%	93%
P/E (x)		
2020E	16.2	24.5
2021E	10.1	15.0
2022E	8.9	12.4
Battery copper foil capacity (GWh)		
2019	30	26
2022E	58	66
2025E	128	126

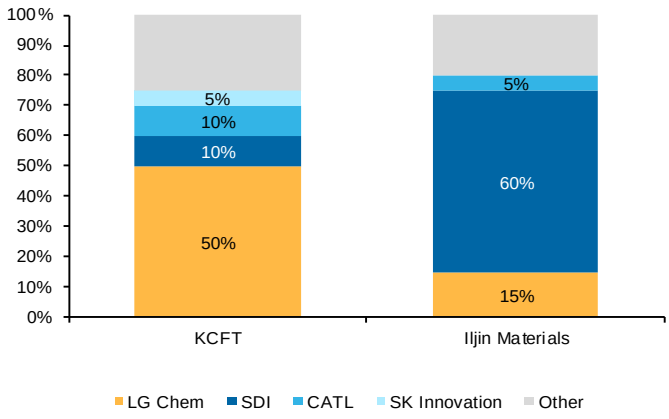
Source: Company data, Macquarie Research, December 2019

Fig 33 Pace of capacity expansion would be similar



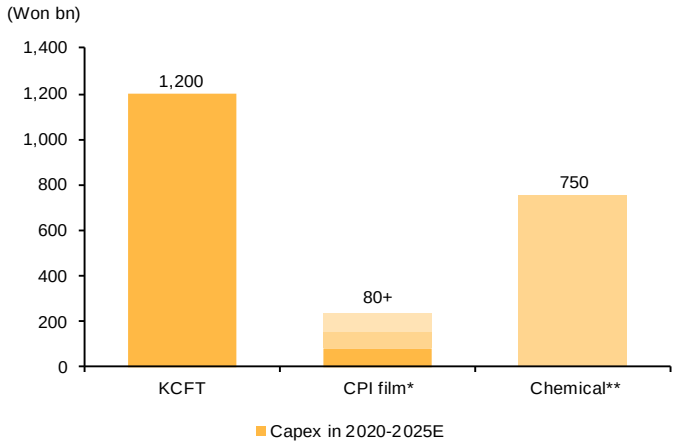
Source: Company data, Macquarie Research, December 2019

Fig 34 Client breakdown: KCFT vs Iljin Materials



Source: Company data, Macquarie Research, December 2019

Fig 35 Capex should be focused on KCFT growth



Note: *Won80bn capex per 1mn m² capacity. 1st round capex of Won80bn already invested, while next rounds would be decided up to market reception. **1.5tr capex divided by two (50% ownership of SKC in chemical business, but burden for SKC could be lower. Source: Company data, Macquarie Research, December 2019

Risks

Key risks to our Outperform rating include:

1) Slower transition from ICE cars to EV, due to a retreat of government's environmental policy, and delayed price drop of EV;

2) Due to the rising conflict between SK and LG Group, LG Chem (market leader) could slowly reduce its dependence on KCFT. Incremental sales volume from SK Innovation (follower) might not catch up to offset the missed sales opportunity from LG;

3) Removal of technology barriers will diminish the advantages of technology leaders like KCFT; and,

4) Limited adoption of CPI film in foldable, rollable display

Earnings outlook: Multi-year boom driven by KCFT and PET film

We expect strong earnings driven by KCFT (capacity expansion), and PET film business (margin expansion) from 2020E onwards.

First, KCFT's new 11kton p.a. capacity will start its trial production at the end of this year, and it will reach its full capacity by 3Q19. Accordingly, we expect 43% YoY top line growth in 2020E. We believe the company will maintain the current level of low-20% OP margin despite margin pressure, given the tight supply-demand situation.

Second, its PET film business will contribute more to its profit after the turnaround in 2019. The major change in top line would be driven by high value-added coating business (SKC ht&m). In addition, we believe PTA prices will come down further, led by massive ramp-up of new PTA facilities in 2020-21E. In turn, we expect overall OP margin of the business to improve steadily from 4% in 2019 to 7% in 2021E. We expect additional positives from the mass production of CPI film from early 2021E.

Fig 36 Earnings snapshot

(Won bn)	1Q19	2Q19	3Q19	4Q19E	1Q20E	2Q20E	3Q20E	4Q20E	1Q21E	2Q21E	3Q21E	4Q21E	2017	2018	2019E	2020E	2021E
Sales	604.0	639.0	636.6	640.0	730.1	770.6	799.1	822.3	873.8	888.1	897.5	925.7	2,653.5	2,767.8	2,519.6	3,122.1	3,585.1
GP	107.7	120.7	110.2	110.1	145.3	159.9	168.1	172.4	191.0	192.7	190.0	195.6	426.2	478.7	448.6	645.8	769.3
OP	36.2	48.3	40.5	39.7	63.0	74.1	79.6	80.9	93.5	93.9	90.2	92.6	175.7	201.1	164.7	297.6	370.2
NP	19.1	13.3	21.6	5.8	20.5	26.6	31.4	31.7	45.0	45.3	42.7	44.3	136.4	120.6	59.8	110.2	177.3
Margin																	
GPM	17.8%	18.9%	17.3%	17.2%	19.9%	20.8%	21.0%	21.0%	21.9%	21.7%	21.2%	21.1%	16.1%	17.3%	17.8%	20.7%	21.5%
OPM	6.0%	7.6%	6.4%	6.2%	8.6%	9.6%	10.0%	9.8%	10.7%	10.6%	10.1%	10.0%	6.6%	7.3%	6.5%	9.5%	10.3%
NPM	3.2%	2.1%	3.4%	0.9%	2.8%	3.4%	3.9%	3.9%	5.1%	5.1%	4.8%	4.8%	5.1%	4.4%	2.4%	3.5%	4.9%
Sales breakdown																	
KCFT					96	127	142	151	152	153	157	177				517	639
Chemical	192	202	188	189	177	177	177	176	183	183	183	183	785	871	771	706	734
Industry materials (PET film)	249	257	272	274	274	274	274	274	301	301	301	301	1,010	1,081	1,052	1,096	1,203
Electronic Materials	81	79	79	75	75	79	83	87	92	96	96	96	268	316	314	325	380
Cosmetics*	28	29	23	23	26	27	28	30	31	28	28	29	103	101	104	111	117
Telecommunication**	54	72	75	78	82	86	95	104	115	126	133	139	488	399	279	368	513
Sales growth (QoQ/YoY)																	
KCFT					8%	32%	12%	6%	1%	1%	2%	13%			19%	43%	24%
Chemical	-5%	5%	-7%	1%	-7%	0%	0%	0%	4%	0%	0%	0%	11%	11%	-11%	-8%	4%
Industry materials (PET film)	0%	3%	6%	1%	0%	0%	0%	0%	10%	0%	0%	0%	9%	7%	-3%	4%	10%
Electronic Materials	-7%	-3%	1%	-5%	0%	5%	5%	5%	5%	5%	0%	0%	27%	18%	-1%	3%	17%
Cosmetics	7%	3%	-20%	1%	10%	5%	5%	5%	5%	-10%	0%	5%	5%	-2%	3%	7%	6%
Telecommunication	-64%	35%	3%	5%	5%	5%	10%	10%	10%	10%	5%	5%	17%	-18%	-30%	32%	40%
Sales mix																	
KCFT					13%	17%	18%	18%	17%	17%	17%	19%				17%	18%
Chemical	32%	32%	30%	30%	24%	23%	22%	21%	21%	21%	20%	20%	30%	31%	31%	23%	20%
Industry materials (PET film)	41%	40%	43%	43%	38%	36%	34%	33%	34%	34%	33%	32%	38%	39%	42%	35%	34%
Electronic Materials	13%	12%	12%	12%	10%	10%	10%	11%	10%	11%	11%	10%	10%	11%	12%	10%	11%
Cosmetics	5%	5%	4%	4%	4%	3%	4%	4%	4%	3%	3%	3%	4%	4%	4%	4%	3%
Telecommunication	9%	11%	12%	12%	11%	11%	12%	13%	13%	14%	15%	15%	18%	14%	11%	12%	14%
OP breakdown																	
KCFT					18	27	32	34	35	35	31	36				110	136
Chemical	27	30	25	23	21	21	22	21	23	23	23	23	126	149	104	85	92
Industry materials (PET film)	4	12	14	10	17	17	17	14	23	23	23	19	-2	-2	39	64	87
Electronic Materials	2	1	-3	2	2	3	3	5	6	7	7	7	19	22	1	13	27
Cosmetics	4	3	2	3	3	3	3	4	3	3	3	3	16	17	13	13	13
Telecommunication	-1	3	3	2	2	3	3	3	3	4	4	4	16	14	7	11	15
OP mix																	
KCFT					29%	37%	40%	42%	37%	37%	34%	39%				37%	37%
Chemical	75%	62%	61%	57%	33%	29%	27%	26%	25%	25%	26%	25%	72%	74%	63%	29%	25%
Industry materials (PET film)	10%	24%	33%	26%	27%	23%	21%	17%	24%	24%	25%	21%	-1%	-1%	24%	22%	23%
Electronic Materials	5%	1%	-8%	4%	2%	4%	4%	6%	7%	7%	7%	7%	11%	11%	0%	4%	7%
Cosmetics	12%	7%	6%	8%	5%	4%	4%	4%	4%	3%	3%	4%	9%	8%	8%	4%	3%
Telecommunication	-2%	5%	8%	6%	4%	3%	4%	4%	4%	4%	4%	5%	9%	7%	5%	4%	4%
OP margin																	
KCFT					19%	21%	22%	22%	23%	23%	20%	20%				21%	21%
Chemical	14%	15%	13%	12%	12%	12%	12%	12%	13%	13%	13%	13%	16%	17%	14%	12%	13%
Industry materials (PET film)	1%	5%	5%	4%	6%	6%	6%	5%	7%	7%	7%	6%	0%	0%	4%	6%	7%
Electronic Materials	2%	1%	-4%	2%	2%	4%	4%	6%	7%	7%	7%	7%	7%	7%	0%	4%	7%
Cosmetics	16%	12%	10%	13%	12%	12%	12%	12%	11%	11%	11%	11%	16%	17%	13%	12%	11%
Telecommunication	-1%	4%	4%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	4%	3%	3%	3%

Note: *Cosmetics (SK Bioland), Telecommunication (SK Telesys) Source: Company data, Macquarie Research, December 2019

Corporate Governance and Risk Score

Macquarie's proprietary Corporate Governance and Risk Score ("MGRS") places SKC in the 2nd quartile in Asia.

- Key positive factors in Macquarie Governance & Risk Score
  - ⇒ SKC is under stable corporate governing structure with SK Holdings (Group holding company) having 41% of stake.
  - ⇒ The company has been in operation for a long time with no major corporate governance issues, as it was established in 1976.
  - ⇒ Its accruals (Net income – Operating cashflow) is negative during 2016-18, indicating higher probability of future earnings.
- Key negative factors in Macquarie Governance & Risk Score
  - ⇒ The company went through restructuring of its solar panel film business in 2017, and now undergoing substantial change of its business model.
  - ⇒ Battery cell industry is becoming concentrated: top three players (LG Chem, CATL, and Panasonic) accounts for around 50% of market share, in terms of GWh capacity.

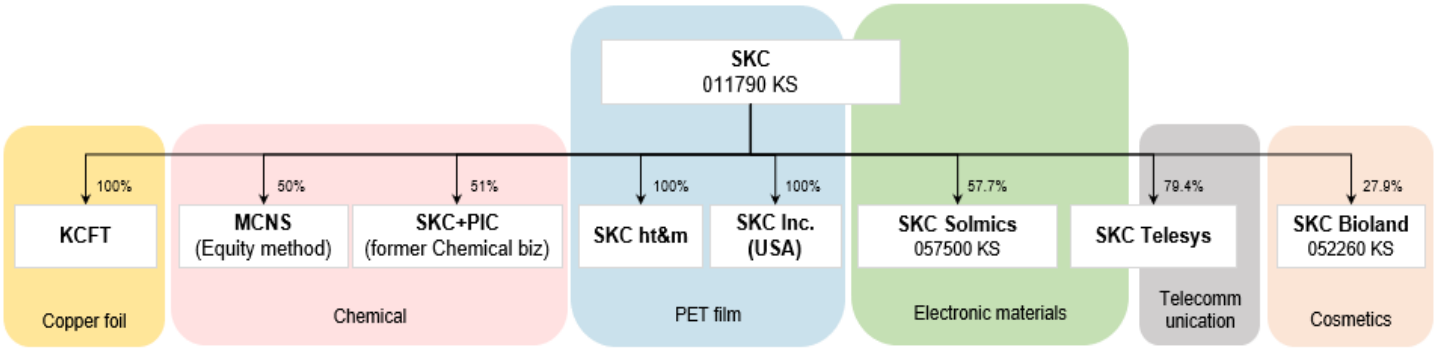
Fig 37 Corporate Governance Score – SKC's position by quartile

	Q1	Q2	Q3	Q4
Overall Score		●		
Corporate Governance		●		
History			●	
Shareholding				●
Access		●		
Board & Mgmt	●			
Compensation		●		
Balance Sheet Mgmt		●		
Risk (Q1=Low risk, Q4=High risk)	●			
Accounting & Audit	●			
Visibility of Growth		●		
Earnings Quality and Risk			●	
True BS Strength	●			
Misc Risks		●		

Source: Company data, Macquarie Research, December 2019

Appendix

Fig 38 SKC's business area and key subsidiaries



Source: Company data, Macquarie Research, December 2019

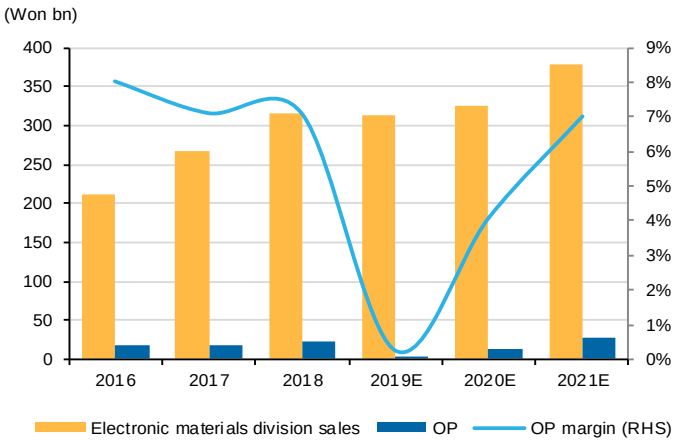
Other business

Electronic Materials (SKC, SKC Solmics (057500 KS), SK Telesys)

Three different entities are involved in the business, without overlap of the product portfolio: SKC (CMP pad, soft magnetic materials), SKC Solmics (quartz, disposable silicon rings, cleaning chemicals), and SK Telesys (photoresist, deposition, cleaning chemicals). It was SK Group's group-wise strategy to internalize materials for SK Hynix's memory production.

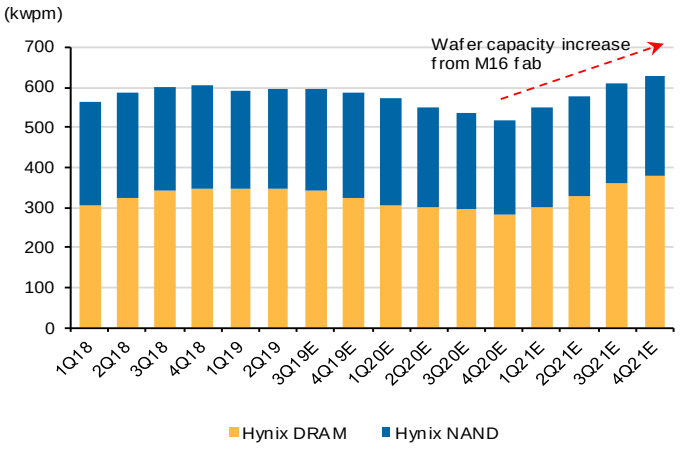
We expect the business to take off from 2021E, with memory upcycle and more captive business opportunities from SK Hynix (wafer capacity increase from M16 fab).

Fig 39 Electronic material sales to take off from 2021E…



Source: Company data, Macquarie Research, December 2019

Fig 40 …thanks to memory upcycle and more captive business opportunities from SK Hynix



Source: Company data, Macquarie Research, December 2019

Cosmetics (SK Bioland, 052260 KS)

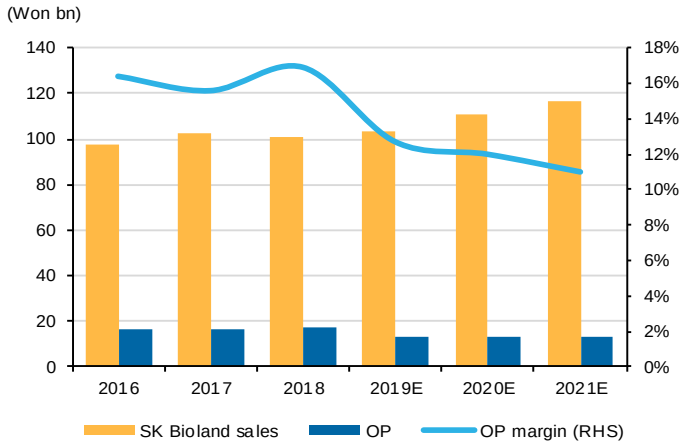
SK Bioland makes and sells naturally extracted ingredients for medicine, cosmetics and health functional foods. The firm's core competency lies in microbial fermentation technology used to produce sheets for facial mask, with it moving beyond cosmetic ingredients to high value-added functional foods, and pharmaceutical ingredients.

The company's sales were hit in 3Q19 due to slower cosmetic ingredient sales in the Chinese cosmetics market. The company's main business focus is sales growth via the China plant, and product diversification to pharmaceutical ingredients, and facial mask products.

Telecommunication (SK Telesys)

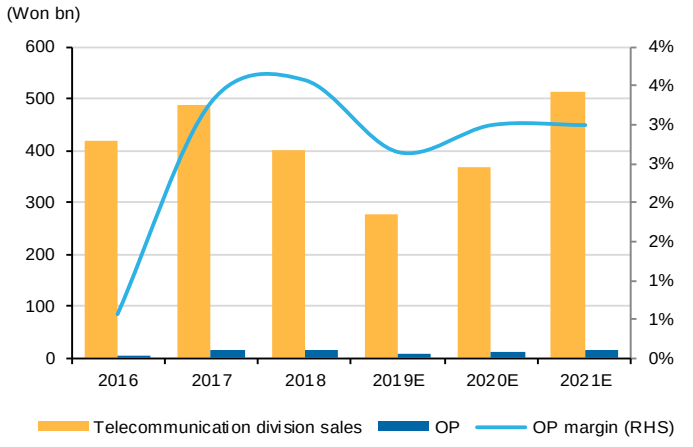
While 30% of SK Telesys' sales are generated from electronics materials, the other 70% comes from final assembly and installation of wireless communication antenna. The main business is supplying 4G LTE based antenna to its group affiliate, SK Telecom. In 2019, sales are likely to shrink by 30% YoY, as telecom companies are rapidly building up 5G infrastructure, while 4G LTE antenna replacement is out of focus. We expect the telecommunication business sales to jump from 2021E, when the company would be able to supply 5G modules for SK Telecom.

Fig 41 SK Bioland's business sales & OP



Source: Company data, Macquarie Research, December 2019

Fig 42 Telecommunication business' sales & OP



Source: Company data, Macquarie Research, December 2019

Macquarie Quant Alpha Model Views

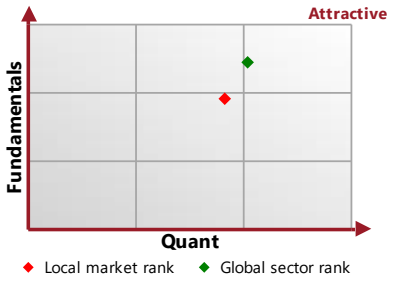
The Quant View page below has been derived from models that are developed and maintained by Sales and Trading personnel at Macquarie. The models are not a product of the Macquarie Research Department.

The quant model currently holds a marginally positive view on SKC. The strongest style exposure is Growth, indicating this stock has good historic and/or forecast growth. Growth metrics focus on both top and bottom line items. The weakest style exposure is Profitability, indicating this stock is not efficiently converting investments to earnings; proxied by ratios like ROE or ROA.

513/1592

Global rank in Materials

% of BUY recommendations	92% (12/13)
Number of Price Target downgrades	0
Number of Price Target upgrades	4

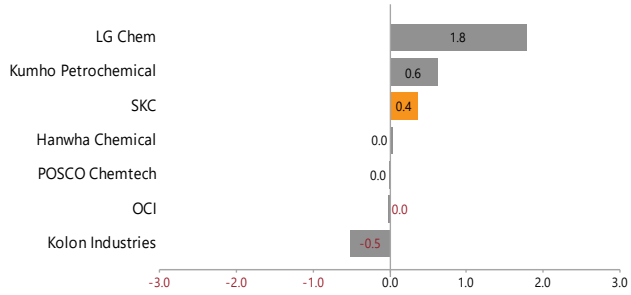


Displays where the company's ranked based on the fundamental consensus Price Target and Macquarie's Quantitative Alpha model.

Two rankings: Local market (Korea) and Global sector (Materials)

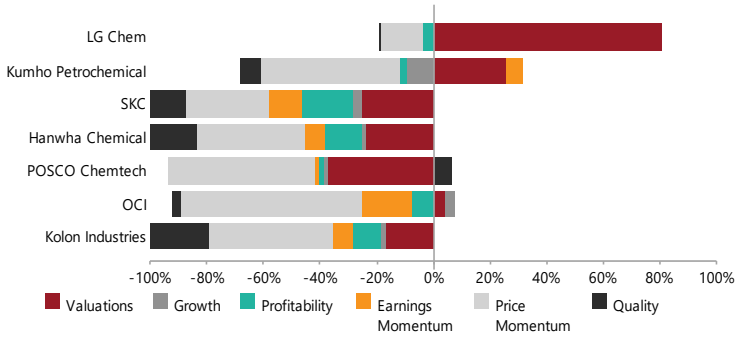
Macquarie Alpha Model ranking

A list of comparable companies and their Macquarie Alpha model score (higher is better).



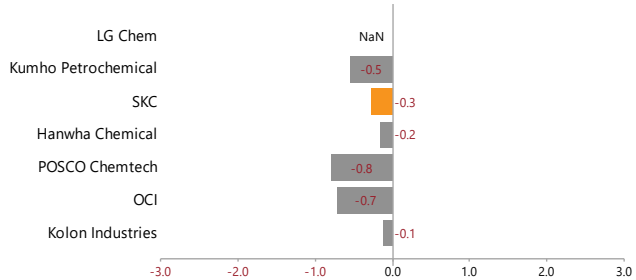
Factors driving the Alpha Model

For the comparable firms this chart shows the key underlying styles and their contribution to the current overall Alpha score.



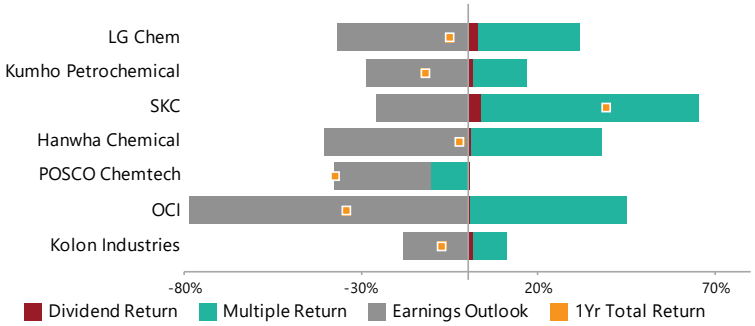
Macquarie Earnings Sentiment Indicator

The Macquarie Sentiment Indicator is an enhanced earnings revisions signal that favours analysts who have more timely and higher conviction revisions. Current score shown below.



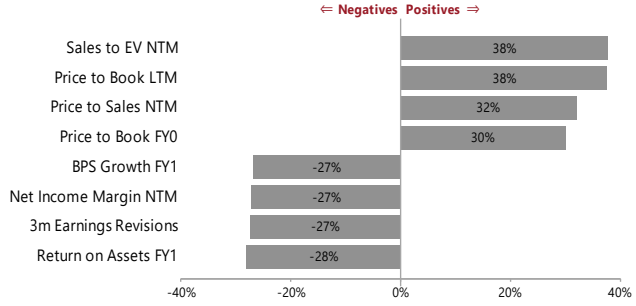
Drivers of Stock Return

Breakdown of 1 year total return (local currency) into returns from dividends, changes in forward earnings estimates and the resulting change in earnings multiple.



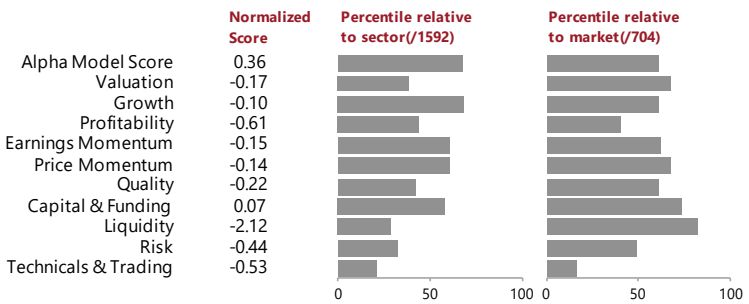
What drove this Company in the last 5 years

Which factor score has had the greatest correlation with the company's returns over the last 5 years.



How it looks on the Alpha model

A more granular view of the underlying style scores that drive the alpha (higher is better) and the percentile rank relative to the sector and market.



Source (all charts): FactSet, Thomson Reuters, and Macquarie Quant. For more details on the Macquarie Alpha model or for more customised analysis and screens, please contact the Macquarie Global Quantitative/Custom Products Group (cpg@macquarie.com)

SKC (011790 KS, Outperform, Target Price: Won75,000)

Quarterly Results		3Q/19A	4Q/19E	1Q/20E	2Q/20E
Revenue	**bn**	**637**	**640**	**730**	**771**
Gross Profit	**bn**	**110**	**110**	**145**	**160**
Cost of Goods Sold	bn	526	530	585	611
EBITDA	**bn**	**77**	**78**	**102**	**114**
Depreciation	bn	36	38	39	40
Amortisation of Goodwill	bn	0	0	0	0
Other Amortisation	bn	0	0	0	0
EBIT	**bn**	**41**	**40**	**63**	**74**
Net Interest Income	bn	0	-13	-13	-18
Associates	bn	1	0	6	6
Exceptionals	bn	0	0	0	0
Forex Gains / Losses	bn	0	0	0	0
Other Pre-Tax Income	bn	-11	-17	-16	-17
Pre-Tax Profit	**bn**	**31**	**9**	**39**	**45**
Tax Expense	bn	-8	-3	-11	-11
Net Profit	**bn**	**23**	**7**	**28**	**34**
Minority Interests	bn	-1	-1	-8	-8
Reported Earnings	**bn**	**23**	**7**	**28**	**34**
Adjusted Earnings	**bn**	**22**	**6**	**20**	**27**
EPS (rep)		603.4	181.1	749.5	913.8
EPS (adj)		576.0	153.6	546.1	708.3
EPS Growth yoy (adj)	%	-45.7	773.6	7.3	100.0
EBITDA Margin	%	12.0	12.2	14.0	14.8
EBIT Margin	%	6.4	6.2	8.6	9.6
Earnings Split	%	36.2	9.6	18.6	24.1
Revenue Growth	%	-7.7	-10.3	20.9	20.6
EBIT Growth	%	-24.9	-24.8	74.0	53.6

Profit & Loss		2018A	2019E	2020E	2021E
Revenue	**bn**	**2,768**	**2,520**	**3,122**	**3,585**
Gross Profit	**bn**	**479**	**449**	**646**	**769**
Cost of Goods Sold	bn	2,289	2,071	2,476	2,816
EBITDA	**bn**	**328**	**310**	**458**	**541**
Depreciation	bn	127	145	160	171
Amortisation of Goodwill	bn	0	0	0	0
Other Amortisation	bn	0	0	0	0
EBIT	**bn**	**201**	**165**	**298**	**370**
Net Interest Income	bn	-12	-13	-67	-71
Associates	bn	63	4	22	41
Exceptionals	bn	0	0	0	0
Forex Gains / Losses	bn	0	0	0	0
Other Pre-Tax Income	bn	-70	-66	-65	-65
Pre-Tax Profit	**bn**	**182**	**90**	**188**	**275**
Tax Expense	bn	-41	-23	-47	-64
Net Profit	**bn**	**141**	**67**	**141**	**211**
Minority Interests	bn	-20	-8	-31	-33
Reported Earnings	**bn**	**141**	**67**	**141**	**211**
Adjusted Earnings	**bn**	**121**	**60**	**110**	**177**
EPS (rep)		3,758	1,796	3,759	5,613
EPS (adj)		3,213	1,593	2,936	4,724
EPS Growth (adj)	%	9.6	-50.4	84.3	60.9
PE (rep)	x	12.3	25.7	12.3	8.2
PE (adj)	x	14.3	28.9	15.7	9.8
Total DPS		943.7	1,000	1,000	1,000
Total Div Yield	%	2.0	2.2	2.2	2.2
Basic Shares Outstanding	m	38	38	38	38
Diluted Shares Outstanding	m	38	38	38	38

Profit and Loss Ratios		2018A	2019E	2020E	2021E
Revenue Growth	%	4.3	-9.0	23.9	14.8
EBITDA Growth	%	10.0	-5.6	47.8	18.2
EBIT Growth	%	14.5	-18.1	80.6	24.4
Gross Profit Margin	%	17.3	17.8	20.7	21.5
EBITDA Margin	%	11.9	12.3	14.7	15.1
EBIT Margin	%	7.3	6.5	9.5	10.3
Net Profit Margin	%	4.4	2.4	3.5	4.9
Payout Ratio	%	29.4	62.8	34.1	21.2
EV/EBITDA	x	8.2	10.2	6.7	5.5
EV/EBIT	x	12.1	18.9	10.0	7.8
Balance Sheet Ratios					
ROE	%	8.1	3.8	7.6	12.7
ROA	%	5.4	4.1	6.3	6.8
ROIC	%	5.5	4.1	7.1	7.0
Net Debt/Equity	%	75.3	80.0	99.3	92.2
Interest Cover	x	16.2	12.3	4.5	5.2
Price/Book	x	1.1	1.1	1.3	1.2
Book Value per Share		40,834.7	41,998.3	35,408.7	39,133.1

Cashflow Analysis		2018A	2019E	2020E	2021E
EBITDA	**bn**	**328**	**310**	**458**	**541**
Tax Paid	bn	-41	-23	-47	-64
Chgs in Working Cap	bn	15	-10	141	-32
Net Interest Paid	bn	-12	-13	-67	-71
Other	bn	-58	-45	-43	-24
Operating Cashflow	**bn**	**232**	**218**	**442**	**350**
Acquisitions	bn	0	0	0	0
Capex	bn	-185	-257	-270	-272
Asset Sales	bn	0	0	0	0
Other	bn	-28	-5	-438	-25
Investing Cashflow	**bn**	**-213**	**-262**	**-708**	**-296**
Dividend (Ordinary)	bn	-35	-38	-38	-38
Equity Raised	bn	1	0	-320	0
Debt Movements	bn	2	154	533	0
Other	bn	-3	-9	0	0
Financing Cashflow	**bn**	**-34**	**108**	**175**	**-38**
Net Chg in Cash/Debt	**bn**	**-16**	**64**	**-91**	**16**
Free Cashflow	**bn**	**47**	**-39**	**172**	**78**

Balance Sheet		2018A	2019E	2020E	2021E
Cash	bn	160	224	134	149
Receivables	bn	346	364	467	526
Inventories	bn	353	414	508	570
Investments	bn	651	630	563	563
Fixed Assets	bn	1,979	2,144	2,255	2,355
Intangibles	bn	233	247	238	229
Other Assets	bn	111	129	1,148	1,148
Total Assets	**bn**	**3,833**	**4,152**	**5,311**	**5,540**
Payables	bn	445	524	673	758
Short Term Debt	bn	610	606	606	606
Long Term Debt	bn	826	1,011	1,544	1,544
Provisions	bn	0	0	0	0
Other Liabilities	bn	258	267	456	461
Total Liabilities	**bn**	**2,138**	**2,409**	**3,280**	**3,369**
Shareholders' Funds	bn	1,653	1,678	1,750	1,890
Minority Interests	bn	162	167	703	703
Other	bn	-121	-101	-421	-421
Total S/H Equity	**bn**	**1,695**	**1,743**	**2,032**	**2,171**
Total Liab & S/H Funds	**bn**	**3,833**	**4,152**	**5,311**	**5,540**

All figures in Won unless noted.
Source: Company data, Macquarie Research, December 2019

EQUITIES

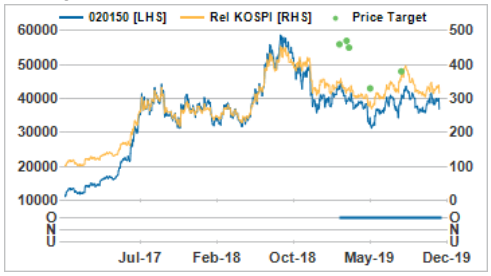
020150 KS Outperform
Price (at 06:14, 05 Dec 2019 GMT) Won36,850

Valuation - PER	Won	48,000
12-month target	Won	48,000
Upside/Downside	%	+30.3
12-month TSR	%	+31.1
Volatility Index		Medium
GICS sector Technology Hardware & Equipment		
Market cap	Wonbn	1,718
Market cap	US$m	1,423
Free float	%	46
30-day avg turnover	US$m	12.5
Number shares on issue	m	46.63

Investment fundamentals

Year end 31 Dec		2018A	2019E	2020E	2021E
Revenue	bn	502.0	580.9	714.4	916.3
EBIT	bn	48.7	64.9	96.8	158.5
EBIT growth	%	-1.6	33.3	49.1	63.7
Reported profit	bn	41.3	51.5	74.5	121.5
Adjusted profit	bn	41.3	51.5	74.5	121.5
EPS rep	Won	897	1,117	1,615	2,635
EPS rep growth	%	-8.4	24.6	44.5	63.1
EPS adj	Won	897	1,117	1,615	2,635
EPS adj growth	%	-11.1	24.6	44.5	63.1
PER rep	x	41.1	33.0	22.8	14.0
PER adj	x	41.1	33.0	22.8	14.0
Total DPS	Won	0	300	300	300
Total div yield	%	0.0	0.8	0.8	0.8
ROA	%	7.3	7.8	9.6	14.4
ROE	%	7.8	9.2	12.0	17.2
EV/EBITDA	x	23.0	16.0	9.6	6.8
Net debt/equity	%	-6.2	6.7	15.0	6.3
P/BV	x	3.2	2.9	2.6	2.2

020150 KS rel KOSPI performance, & rec history



Note: Recommendation timeline - if not a continuous line, then there was no Macquarie coverage at the time or there was an embargo period.
Source: FactSet, Macquarie Research, December 2019
(all figures in Won unless noted, TP in KRW)

Macquarie Governance and Risk Score (MGRS)
On our proprietary Governance and Risk Score Iljin Materials scores in the third quartile of our current universe coverage.

Analysts
Macquarie Securities Korea Limited

Sonny Lee +82 2 3705 8678
sonny.lee@macquarie.com

Iljin Materials (020150 KS)
Healthy demand for EV battery copper foil

Key points

- We are increasingly positive on the EV battery copper foil sector, given strong demand for ultra-thin copper foil and product supply constraints.
- Iljin's exposure to the high-margin EV battery is sequentially increasing, driven by Samsung SDI and LG Chem's EV battery growth.
- We reiterate our Outperform rating with a potential TSR of 31%.

Conclusion

- We are increasingly bullish on EV battery copper foil industry. (Korea EV battery materials – Bullish on EV battery copper foil) Iljin Materials (Iljin), an industry leader, is the key beneficiary of robust demand and tight supply, in our view.

Impact

- **Battery copper foil will be seller's market through 2025E.** We forecast an EV battery copper foil demand CAGR of 30% in 2019-25E and expect the market to see supply shortage from 2020. The ultra-thin segment (under-6 ㎛ thickness) is likely to experience a severe supply shortage. We believe EV battery-makers will gradually replace current mainstream 8 ㎛ with the ultra-thin product to significantly increase energy density. Due to analogue characteristics of the manufacturing process (combination of mechanical and chemical engineering), the technological leadership of industry leaders (including Iljin) should persist.
- **Sales mix improves towards high-margin EV battery copper foil.** We estimate current EV exposure within I2B (battery copper foil, contributing 86% of consolidated OP in 2020E) should be over 50%, followed by small battery (30%). This should only rise on 1) increasing EV battery sales portion within Samsung SDI (SDI), and 2) Iljin's broadening client base to LG Chem for its EV battery. This is a positive development for Iljin, as EV battery copper foil generates higher than firm average OP margin.
- **Iljin is the pure play in battery copper foil.** We believe SKC and Iljin are neck-and-neck when it comes to EV battery copper foil capacity and technology. Iljin is more leveraged to battery copper foil (86% of OP in 2020E) than SKC (37%) but is trading at a higher valuation (22.8x 2020E P/E vs SKC at 15.7x).

Earnings and target price revision

- No change

Price catalyst

- 12-month price target: Won48,000 based on a PER methodology.
- Catalyst: Capacity expansion, better than expected shipment volume.

Action and recommendation

- The stock shed 7% on 4 Dec on SDI's conservative 2020E outlook. That said, SDI's EV battery business growth is on track, and Iljin is generating the largest portion of profit. We recommend investors to take advantage of the short-term weakness and accumulate the stock. Maintain OP.

Macquarie Quant Alpha Model Views

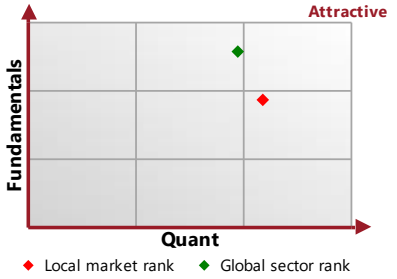
The Quant View page below has been derived from models that are developed and maintained by Sales and Trading personnel at Macquarie. The models are not a product of the Macquarie Research Department.

The quant model currently holds a reasonably positive view on Iljin Materials. The strongest style exposure is Price Momentum, indicating this stock has had strong medium to long term returns which often persist into the future. The weakest style exposure is Valuations, indicating this stock is over-priced in the market relative to its peers.

329/932

Global rank in
Technology Hardware & Equipment

% of BUY recommendations	100% (11/11)
Number of Price Target downgrades	3
Number of Price Target upgrades	1

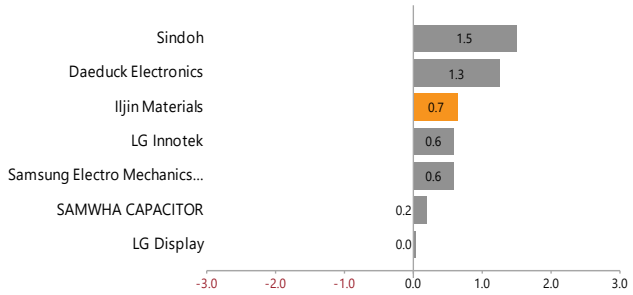


Displays where the company's ranked based on the fundamental consensus Price Target and Macquarie's Quantitative Alpha model.

Two rankings: Local market (Korea) and Global sector (Technology Hardware & Equipment)

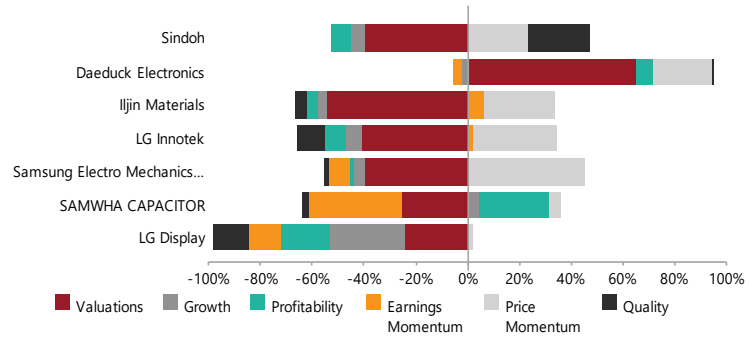
Macquarie Alpha Model ranking

A list of comparable companies and their Macquarie Alpha model score (higher is better).



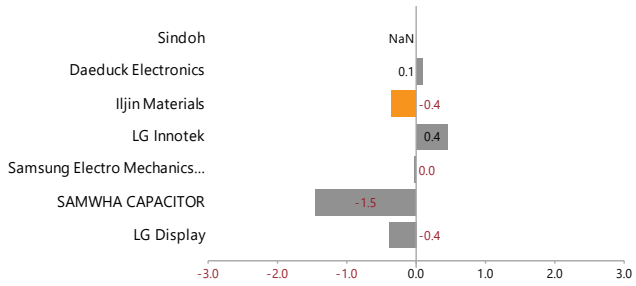
Factors driving the Alpha Model

For the comparable firms this chart shows the key underlying styles and their contribution to the current overall Alpha score.



Macquarie Earnings Sentiment Indicator

The Macquarie Sentiment Indicator is an enhanced earnings revisions signal that favours analysts who have more timely and higher conviction revisions. Current score shown below.



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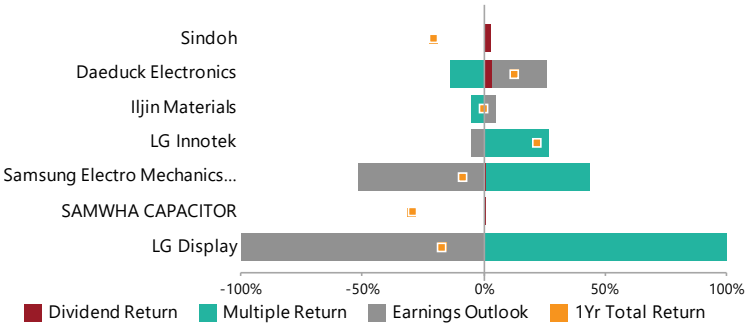

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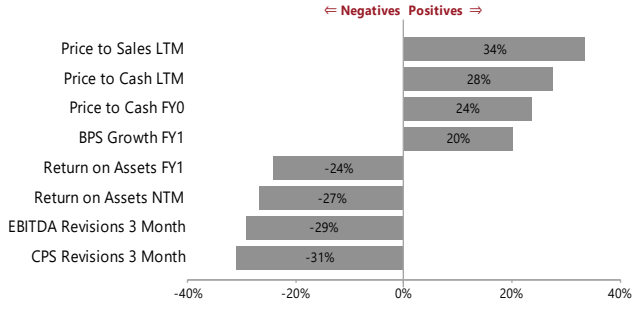

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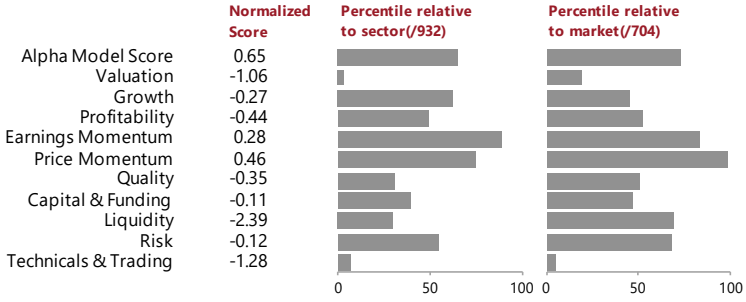
A more granular view of the underlying style scores that drive the alpha (higher is better) and the percentile rank relative to the sector and market.



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Iljin Materials (020150 KS, Outperform, Target Price: Won48,000)

Quarterly Results		2Q/19A	3Q/19E	4Q/19E	1Q/20E
Revenue	**bn**	**152**	**150**	**158**	**163**
Gross Profit	**bn**	**24**	**24**	**29**	**30**
Cost of Goods Sold	bn	128	126	129	134
EBITDA	**bn**	**26**	**26**	**34**	**38**
Depreciation	bn	9	10	14	17
Amortisation of Goodwill	bn	0	0	0	0
Other Amortisation	bn	0	0	0	0
EBIT	**bn**	**17**	**16**	**20**	**21**
Net Interest Income	bn	0	-0	-0	-1
Associates	bn	0	0	0	0
Exceptionals	bn	0	0	0	0
Forex Gains / Losses	bn	1	1	1	1
Other Pre-Tax Income	bn	-0	2	0	0
Pre-Tax Profit	**bn**	**18**	**18**	**21**	**21**
Tax Expense	bn	-5	-5	-5	-5
Net Profit	**bn**	**12**	**13**	**16**	**16**
Minority Interests	bn	0	0	0	0
Reported Earnings	**bn**	**12**	**13**	**16**	**16**
Adjusted Earnings	**bn**	**12**	**13**	**16**	**16**
EPS (rep)		269.8	292.7	347.0	350.1
EPS (adj)		269.8	292.7	347.0	350.1
EPS Growth yoy (adj)	%	-13.4	9.6	99.0	68.4
EBITDA Margin	%	17.3	17.3	21.7	23.3
EBIT Margin	%	11.4	10.4	12.7	12.7
Earnings Split	%	24.1	26.2	31.1	21.7
Revenue Growth	%	27.3	15.8	14.8	35.2
EBIT Growth	%	25.1	-10.2	111.5	74.9

Profit & Loss		2018A	2019E	2020E	2021E
Revenue	**bn**	**502**	**581**	**714**	**916**
Gross Profit	**bn**	**80**	**95**	**136**	**209**
Cost of Goods Sold	bn	422	486	578	708
EBITDA	**bn**	**73**	**105**	**175**	**247**
Depreciation	bn	25	41	78	89
Amortisation of Goodwill	bn	0	0	0	0
Other Amortisation	bn	0	0	0	0
EBIT	**bn**	**49**	**65**	**97**	**159**
Net Interest Income	bn	1	-0	-4	-4
Associates	bn	0	0	0	0
Exceptionals	bn	0	0	0	0
Forex Gains / Losses	bn	2	5	4	4
Other Pre-Tax Income	bn	2	1	1	1
Pre-Tax Profit	**bn**	**54**	**71**	**98**	**160**
Tax Expense	bn	-12	-19	-24	-38
Net Profit	**bn**	**41**	**52**	**74**	**122**
Minority Interests	bn	0	0	0	0
Reported Earnings	**bn**	**41**	**52**	**74**	**122**
Adjusted Earnings	**bn**	**41**	**52**	**74**	**122**
EPS (rep)		896.9	1,117	1,615	2,635
EPS (adj)		896.7	1,117	1,615	2,635
EPS Growth (adj)	%	-11.1	24.6	44.5	63.1
PE (rep)	x	41.1	33.0	22.8	14.0
PE (adj)	x	41.1	33.0	22.8	14.0
Total DPS		0.0	300.0	300.0	300.0
Total Div Yield	%	0.0	0.8	0.8	0.8
Basic Shares Outstanding	m	46	46	46	46
Diluted Shares Outstanding	m	46	46	46	46

Profit and Loss Ratios		2018A	2019E	2020E	2021E
Revenue Growth	%	10.6	15.7	23.0	28.3
EBITDA Growth	%	0.5	43.6	65.9	41.3
EBIT Growth	%	-1.6	33.3	49.1	63.7
Gross Profit Margin	%	15.8	16.4	19.0	22.8
EBITDA Margin	%	14.6	18.2	24.5	27.0
EBIT Margin	%	9.7	11.2	13.5	17.3
Net Profit Margin	%	8.2	8.9	10.4	13.3
Payout Ratio	%	0.0	26.8	18.6	11.4
EV/EBITDA	x	23.0	16.0	9.6	6.8
EV/EBIT	x	34.6	26.0	17.4	10.6
Balance Sheet Ratios					
ROE	%	7.8	9.2	12.0	17.2
ROA	%	7.3	7.8	9.6	14.4
ROIC	%	7.6	9.6	11.7	16.1
Net Debt/Equity	%	-6.2	6.7	15.0	6.3
Interest Cover	x	nmf	163.4	22.8	39.0
Price/Book	x	3.2	2.9	2.6	2.2
Book Value per Share		11,459.5	12,829.0	14,144.2	16,479.2

Cashflow Analysis		2018A	2019E	2020E	2021E
EBITDA	**bn**	**73**	**105**	**175**	**247**
Tax Paid	bn	-12	-19	-24	-38
Chgs in Working Cap	bn	6	-27	-18	-26
Net Interest Paid	bn	1	-0	-4	-4
Other	bn	18	10	5	5
Operating Cashflow	**bn**	**86**	**69**	**135**	**184**
Acquisitions	bn	0	0	0	0
Capex	bn	-119	-182	-180	-120
Asset Sales	bn	0	0	0	0
Other	bn	57	41	0	0
Investing Cashflow	**bn**	**-62**	**-140**	**-180**	**-120**
Dividend (Ordinary)	bn	0	-14	-14	-14
Equity Raised	bn	3	0	0	0
Debt Movements	bn	8	189	0	-50
Other	bn	-29	12	0	0
Financing Cashflow	**bn**	**-17**	**188**	**-14**	**-64**
Net Chg in Cash/Debt	**bn**	**7**	**117**	**-58**	**1**
Free Cashflow	**bn**	**-33**	**-113**	**-45**	**64**

Balance Sheet		2018A	2019E	2020E	2021E
Cash	bn	53	170	112	112
Receivables	bn	81	106	133	169
Inventories	bn	51	73	92	117
Investments	bn	44	57	57	57
Fixed Assets	bn	271	415	516	548
Intangibles	bn	4	5	5	5
Other Assets	bn	186	141	141	141
Total Assets	**bn**	**692**	**966**	**1,055**	**1,147**
Payables	bn	80	109	133	162
Short Term Debt	bn	15	10	10	10
Long Term Debt	bn	5	200	200	150
Provisions	bn	0	0	0	0
Other Liabilities	bn	64	56	60	66
Total Liabilities	**bn**	**164**	**374**	**402**	**387**
Shareholders' Funds	bn	518	572	633	741
Minority Interests	bn	0	0	0	0
Other	bn	10	19	19	19
Total S/H Equity	**bn**	**528**	**592**	**652**	**760**
Total Liab & S/H Funds	**bn**	**692**	**966**	**1,055**	**1,147**

All figures in Won unless noted.
Source: Company data, Macquarie Research, December 2019

EQUITIES

[336370 KS]		Not rated
Stock price as of 02/12/2019	Won	18,900
GICS sector	Electronic equipment, instrument	
Market cap	US$m	484
Avg Value Traded (3m)	US$m	13.8
12m high/low	Won	22,050/5,510
PER FY20	x	21.4
P/BV FY20	x	4.7

Historical financials

YE Dec (US$m)	2016A	2017A	2018A
Revenue	204	256	226
% growth		25.6%	-11.8%
EBIT	30	59	27
% growth		97.7%	-53.7%
EPS	658	1,373	597
% growth		108.7%	-56.6%
EBIT Margin	14.6%	23.0%	12.1%

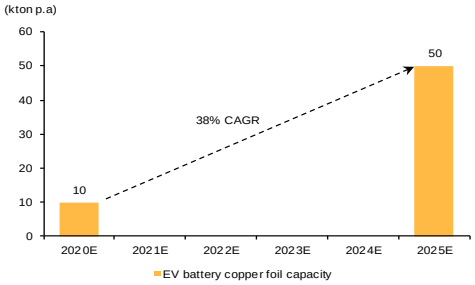
Source: Company data, FactSet, December 2019

Major product line-up (based on 2020 guidance)

Product	Sales %	OP %	OPM	End customers
EV battery copper foil	10%	10%	10%	Global cell makers located in EU market
PCB copper foil	50%	40%	10%	Network equipment companies
OLED material	30%	40%	20%	Samsung Display
Cosmetics	10%	10%	15%	Global cosmetics brands

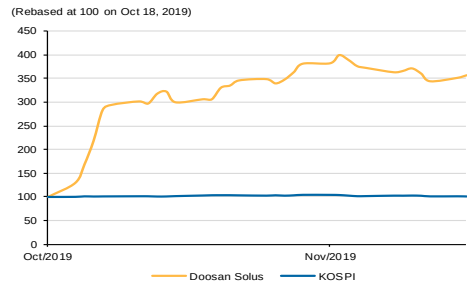
Note: OPM est. by MQ Source: Company data, Macquarie Research, December 2019

EV battery copper foil capacity to grow 5x till 2025



Source: Company guidance, December 2019

Doosan Solus vs KOSPI since the listing



Source: Bloomberg, December 2019

The subject Company discussed in this report is not under Macquarie Research's coverage. This report is not an initiation of coverage on the Company and does not intend to provide any rating or recommendation on the Company.

Analysts

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MacVisit: Doosan Solus
Foraying into EV battery copper foil

Key points

- Doosan Solus' main business is PCB copper foil and OLED material.
- Management sees the EV battery copper foil business as its next growth engine, given strong demand potential and tight supply.
- The stock price has tripled since its listing in Oct 2019, and is trading at a similar multiple to the average of Korean peers.

Doosan Solus (Solus) is a tech material supplier with sales coming mainly from copper foil (60%) and OLED material (25%) in 2019. Solus has a dominant market share in 1) protecting layer (aETL) for Samsung Display's OLED composition and 2) high-end PCB copper foil in the European market, and is making a push into the EV battery copper foil business.

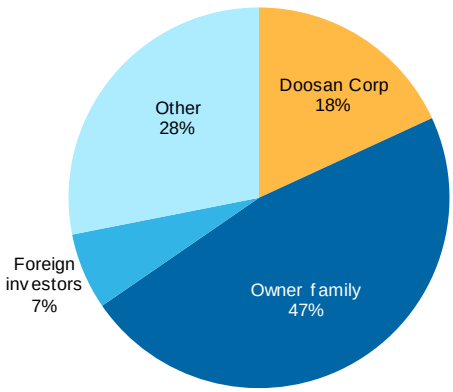
Capturing EV battery copper foil opportunity. Management sees the EV battery copper foil business as its next growth engine given strong demand and tight supply. The company is investing to set up a new Poland plant, where ramp-up is scheduled in 3Q20. The initial capacity is 10kton p.a. (around 20% of Iljin Materials' 2020E capacity) and plan is to expand to 50kton p.a. by 2025E (Fig 5). The company claims to have gone through pilot production of 8 ㎛ and 6 ㎛ thin copper foil, which is behind the industry leaders (Iljin and KCFT) currently mass producing 6 ㎛ products. Solus is confident of the success in the European market: 1) management pointed out the major hurdle for EV battery copper foil is the chemical treatment process, for which it claims to have stabilized the yield by leveraging experience in PCB copper foil from Circuit Foil Luxembourg acquired in 2014; and, 2) the Poland plant is close to clients' European operations, which helps Solus in terms of product quality (prevents corrosion during shipping) and client responsiveness.

5G-driven growth in high-end PCB copper foil. After being acquired by Doosan Corp in 2014, Circuit Foil Luxembourg (CFL, located in Luxemburg) became the only copper foil supplier operating in the EU as its competitor went bankrupt in 2015. CFL has global network equipment companies on its client list. Solus claims CFL is set to benefit from increasing demand for high-end copper foil, thanks to 5G. To capture and process very high radio frequency, surface of copper foil in PCB needs to be flawlessly evened, as bumps tend to absorb frequency and lead to transmission loss. According to Solus, apart from it, there are only few competitors capable of capturing the market.

Leader in Samsung Display's OLED composition. Solus is supplying seven OLED materials to Samsung Display (SDC), key product being aETL (an Electron Transfer Layer, 60% of OLED material sales). It lengthens lifetime of blue emitting diode, the weakest part of OLED structure. Solus has been SDC's sole vendor for aETL since 2015 and expects this to sustain since competitors wouldn't be able to keep up with SDC's heightening qualification process every year for new material set. Solus expects strong growth in its aETL sales, given the material will also be adopted in SDC's QD-OLED TV panel.

Valuation. Since its listing on Oct 18, 2019, the stock price has tripled vs KOSPI up 1% during the same period. Management commented that the split ratio between Solus and Doosan Corp is based on asset size rather than earnings, overly undervaluing Solus. After the big rally, Solus is trading on 2020E P/E of 21.4x (according to FnGuide consensus), similar to Korean copper foil and OLED material peers (Fig 8).

Current ownership

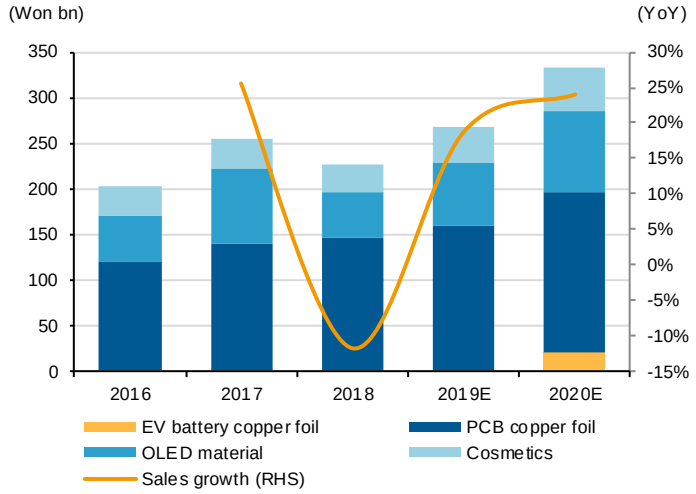


Source: Company data, December 2019

History and corporate governance

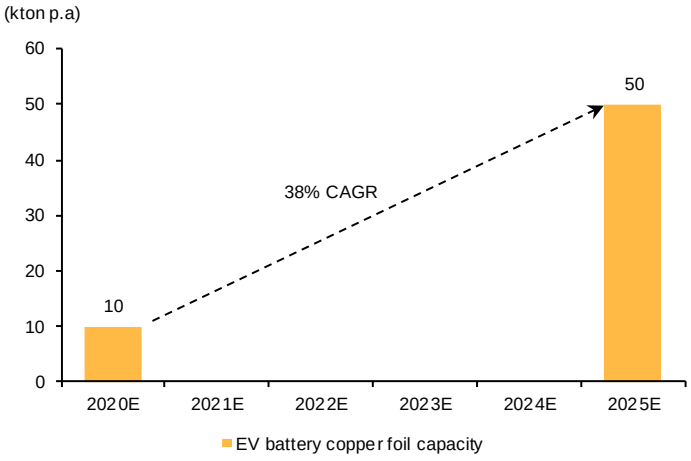
- Doosan Solus (Solus) was split from Doosan Corp (holding company) in Oct 2019, in order to develop high-growth business independently from Doosan Group.
- Solus has four major divisions: 1) OLED material, 2) PCB copper foil (Circuit Foil Luxembourg), 3) EV battery copper foil (Poland plant), and 4) Cosmetics (biochemical ingredients).
- Circuit Foil Luxembourg (CFL), main subsidiary of Solus, was established in 1960. The company was later acquired by Doosan Corp in 2014.
- Doosan Corp started investment in the R&D of next generation display material, which is OLED. The company started to manufacture and supply OLED material in 2009.
- In 2019, Doosan Corp decided to invest in EV battery copper foil by building production facility in Poland. Construction should be done by 1Q20 and ramp-up is scheduled in 3Q20.

Fig 1 Sales trend: EV battery copper foil to generate sales from 2020



Source: Company data, December 2019

Fig 2 EV battery copper foil capacity to reach 50kton p.a. by 2025



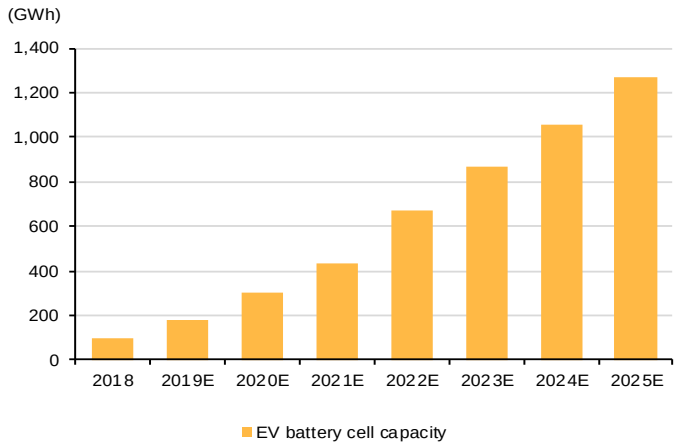
Source: Company data, December 2019

Fig 3 Major product line-up (based on 2020E guidance)

Product	Sales %	OP %	OPM	Note	End customers
EV battery copper foil	10%	10%	10%	Applied in anode of lithium-ion battery	Global cell makers located in EU market
PCB copper foil	50%	40%	10%	Used in forming PCB circuitries	Global network equipment companies
OLED material	30%	40%	20%	aETL (a Electron Transfer Layer, prolongs lifetime of blue emitting diode), HTL (Hole Transfer Layer), etc.	Samsung Display, Chinese OLED panel makers
Cosmetics	10%	10%	15%	Biochemical ingredient for cosmetics	Global cosmetics brands

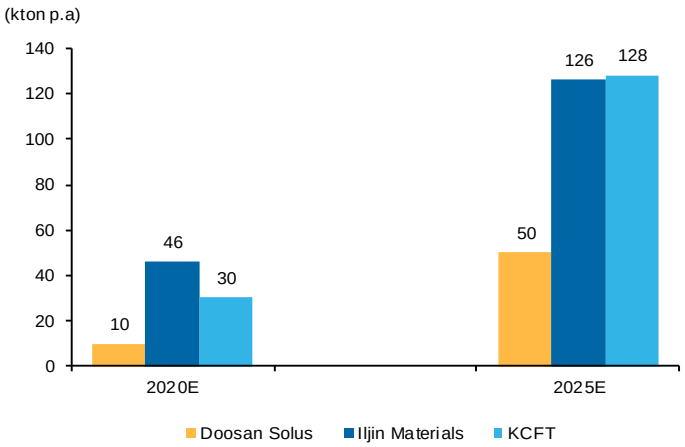
Source: Company data, December 2019

Fig 4 Rapid growth in EV battery capacity suggests considerable upside for EV battery copper foil business



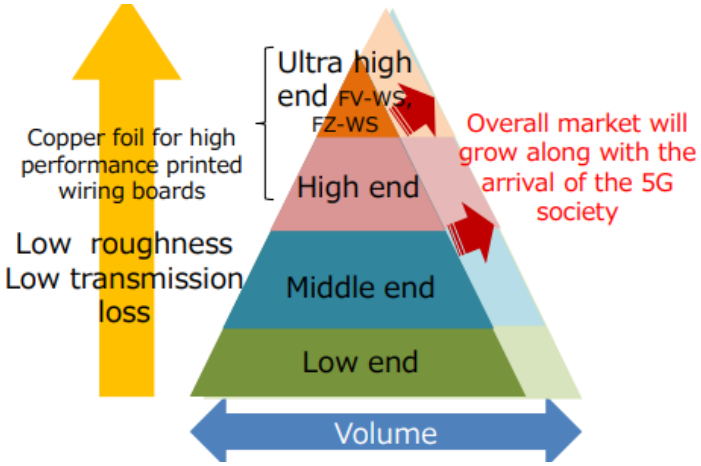
Source: SNE Research, December 2019

Fig 5 Solus' capacity would be around 40% of the industry leaders, Iljin Materials and KCFT, by 2025



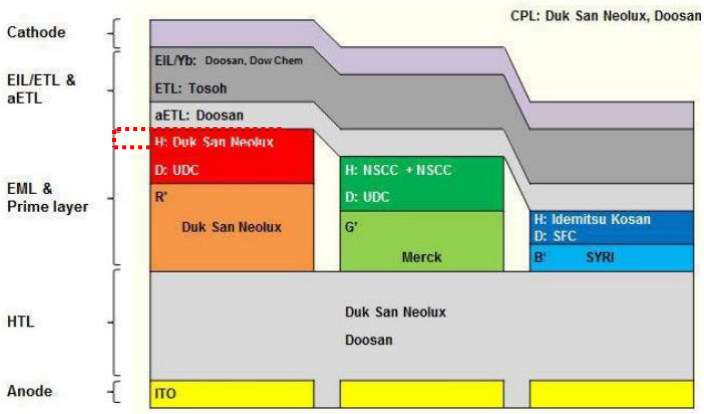
Source: Company data, Macquarie Research, December 2019. Doosan Solus data is based on company guidance

Fig 6 Low roughness copper foil's growth opportunity



Source: Furukawa Electric, December 2019

Fig 7 Solus' aETL material is deposited to protect blue emitting diode



Source: Company data, December 2019

Fig 8 Valuation comparison of Doosan Solus and Korean peer companies

Company	Code	Rec	CP (Lcy)	TP (Lcy)	Mkt Cap (US$mn)	PER (x) 2020E	PER (x) 2021E	PBR (x) 2020E	PBR (x) 2021E	EPS growth (%) 2020E	EPS growth (%) 2021E	ROE (%) 2020E	ROE (%) 2021E
Doosan Solus	**336370 KS**	**NR**	**18,900**	**n/a**	**484**	**21.4**	**14.7**	**4.7**	**3.8**	**n/a**	**n/a**	**18.8**	**22.3**
Iljin Materials – Copper foil	020150 KS	OP	36,850	48,000	1,422	21.9	15.3	2.4	2.1	49.0	42.8	11.8	14.8
SKC – Copper foil	011790 KS	OP	46,100	75,000	1,448	12.6	10.3	1.0	0.9	72.9	22.4	9.2	9.7
Duksan Neolux – OLED material	213420 KS	NR	20,300	n/a	408	20.4	15.8	2.7	2.3	45.7	29.2	14.1	15.7
PEER AVERAGE						**18.3**	**13.8**	**2.0**	**1.8**				

Note: Based on Bloomberg (Iljin Materials, SKC), and FnGuide (Duksan Neolux) consensus estimates; prices as of Dec 4.
The reason SKC's valuation is much lower than Iljin's and Solus's could be its diversified business portfolio (commodity chemical business). Iljin is considered a pure play in battery copper foil.
Source: Company data, Macquarie Research, December 2019

The growth proposition

- Management sees the EV battery copper foil business as its next growth driver, given strong demand growth and tight supply. The company's investment is focused on building a production facility in Poland for EV battery copper foil.
- The initial capacity of the Poland plant is 10kton p.a. and it should expand to 50kton p.a. by 2025. Sales should grow in line with the capacity expansion, per management.
- Solus claims its PCB copper foil business is set to benefit from increasing demand for high-end copper foil, with the proliferation of 5G.
- Solus expects strong growth in its aETL sales, given the material will also be adopted in SDC's QD-OLED TV panel.

The value proposition

- Solus is trading at 2020E P/E of 21.4x (according to FnGuide consensus), similar to Korean copper foil and OLED material peers (Fig 8).

The business model

- Solus, considered a fast-growing business, was split from Doosan Corp. Its sales are broken down into PCB copper foil (60%), OLED material (25%) and cosmetics ingredient (15%) as of 2019.
- Circuit Foil Luxemburg (CFL) runs the PCB copper foil business and is the only copper foil supplier operating in the EU market. CFL has global network equipment companies on its client list.
- The company is making a push into EV battery copper foil by leveraging its experience in CFL.
- Solus has set a dominant position in seven OLED materials in SDC's OLED composition and has been the client's sole vendor for aETL since 2015.

The main risks

- Solus plans to spend Won120bn capex every year to expand the EV battery copper foil capacity, and this far outweighs 2018 OP of Won27bn. The net debt to equity ratio of 35% is likely to go up.
- Other businesses (PCB copper foil and OLED material) require continuous R&D efforts to upgrade products.

Strengths

- Solus' production bases in Europe appeal to both PCB and EV battery clients. Luxemburg (PCB) and Poland (EV battery) plants are close to clients' European operations, which helps Solus in terms of product quality (prevents corrosion during shipping) and client responsiveness.
- Solus has been SDC's sole vendor for aETL since 2015, and expects it to sustain since competitors wouldn't be able to keep up with SDC's heightening qualification process every year for new material set.

Weaknesses

- More than 80% of OP is generated by the tech components that are viewed as cyclical.
- The OLED material business is highly dependent on SDC's OLED panel sales, as SDC accounts for 70% of OLED material sales.

Opportunities

- Lithium-ion battery cell makers are increasing production capacities globally to respond to rapid EV market growth, indicating considerable upside for EV battery copper foil.
- Global network equipment companies need low roughness PCB copper foil to minimize transmission loss, and Solus is one of the few players capable of supplying 5G network PCB copper foil.
- Solus is supplying aETL and other OLED materials to Chinese OLED panel makers by tweaking the chemical structure. The company expects strong demand from Chinese clients for years to come.

Threats

- Existing EV battery copper foil suppliers would consider building a plant in Europe or come up with other measures to overcome the transport issue. Iljin Materials, for example, plans to set up an end-process (slitting) plant to improve client response.
- Unexpected changes in SDC's material set could make some of Solus' materials obsolete.

Financial snapshot (Consolidated, Won bn)

Year ending	2015	2016	2017	2018	Period Ending	1Q18	2Q18	3Q18	4Q18
Revenue		**204**	**256**	**226**	**Revenue**				
Cost of Goods Sold		147	165	165	Cost of Goods Sold				
Gross Profit		57	91	61	Gross Profit				
EBITDA					**EBITDA**				
Depreciation					Depreciation				
Amort of Intangible asset					Amort of Goodwill				
Other Amortisation					Other Amortisation				
EBIT		**30**	**59**	**27**	**EBIT**				
Net Interest Inc/(Exp)		-3	-3	-3	Net Int Income/(Exp)				
Subsidiaries, Associates					Associates				
Forex Gains / Losses					Forex Gains / Losses				
Other Pre-Tax Income					Other Pre-Tax Income				
Pre Tax Profit		**27**	**56**	**24**	**Pre Tax Profit**				
Tax Expenses					Tax Expenses				
Net Profit (Reported)*		**20**	**42**	**18**	**Net Profit (Reported)**				
Minority Interests		0	0	0	Minority Interests				
Adjusted Net Profit		**20**	**42**	**18**	**Adjusted Net Profit**				
					Adjusted NP YOY Δ				
EPS (adj)		**658**	**1,373**	**597**	**EPS (adj)**				
					EBIT Margin				
Total Shares Outstanding (K)		30,589	30,589	30,589	Net Margin				

Cash Flow	2015	2016	2017	2018	Balance Sheet	2015	2016	2017	2018
EBITDA					Cash & Equivalents		56	57	54
Tax Paid					Receivables		40	36	41
Chgs in Working Capital					Inventories		34	47	46
Net Interest Paid					Investments				
Other					Associates				
Operating Cashflow					Fixed Assets				
Acquisitions					Intangibles				
Capex					Other Assets				
Asset Sales					**Total Assets**		**232**	**229**	**249**
Other					Payables				
Investing Cashflow					Short Term Debt		0	1	4
Dividend					Long Term Debt		98	81	88
Equity Raises					Provisions				
Debt Movements					Other Liabilities				
Other					**Total Liabilities**		**139**	**128**	**142**
Financing Cashing Flow					Paid-in capital				
Net Change in Cash/Debt					Retained Earnings				
Free Cash Flow					Other				
					Total S/H Equity		**93**	**101**	**107**
					Total Liab & S/H Funds		232	229	249

	2015	2016	2017	2018		2015	2016	2017	2018
Revenue Growth			***25.6%***	***-11.8%***	ROE		21.6%	43.4%	17.6%
EBITDA Growth					ROA		8.7%	18.2%	7.6%
EBIT Growth			***97.7%***	***-53.7%***	ROIC		10.5%	23.0%	9.2%
Net Profit (Rep.) Growth					Net Debt/Equity		46.1%	24.8%	35.3%
EPS (adj) Growth					Interest Cover		10.0	20.4	9.2
EBITDA Margin					Payout Ratio				
Gross Margin		28.0%	35.6%	27.1%					
EBIT Margin		14.6%	23.0%	12.1%	Working Capital Days				
Net Profit Margin					Receivable Days		72	54	62
					Inventory Days		61	58	75
Valuation					Payable Days				
Share Price				18,900					
PER (x)				31.7					
PBR (x)									
EV/EBITDA (x)									
Div Yield (Current) (%)									

Note: Most figures are not disclosed, as the split took place in October 2019. *Net profit has not been defined post the split. Based on few of its financial disclosures (OP, interest expense) + the company's comment they don't have special non-OP items + applying average corporate tax rate of 25%.
Source: Company data, December 2019

Important disclosures:

Recommendation definitions

Macquarie – Asia, USA, Europe and Mazi Macquarie (SA):
Outperform – expected return >10%
Neutral – expected return from -10% to +10%
Underperform – expected return <-10%

Macquarie - Australia/New Zealand
Outperform – expected return >10%
Neutral – expected return from 0% to 10%
Underperform – expected return <0%

Note: expected return is reflective of a Medium Volatility stock and should be assumed to adjust proportionately with volatility risk

Volatility index definition*

This is calculated from the volatility of historical price movements.

Very high–highest risk – Stock should be expected to move up or down 60–100% in a year – investors should be aware this stock is highly speculative.

High – stock should be expected to move up or down at least 40–60% in a year – investors should be aware this stock could be speculative.

Medium – stock should be expected to move up or down at least 30–40% in a year.

Low–medium – stock should be expected to move up or down at least 25–30% in a year.

Low – stock should be expected to move up or down at least 15–25% in a year.
* Applicable to select stocks in Asia/Australia/NZ

Recommendations – 12 months
Note: Quant recommendations may differ from Fundamental Analyst recommendations

Financial definitions

All "Adjusted" data items have had the following adjustments made:
Added back: goodwill amortisation, provision for catastrophe reserves, IFRS derivatives & hedging, IFRS impairments & IFRS interest expense
Excluded: non recurring items, asset revals, property revals, appraisal value uplift, preference dividends & minority interests

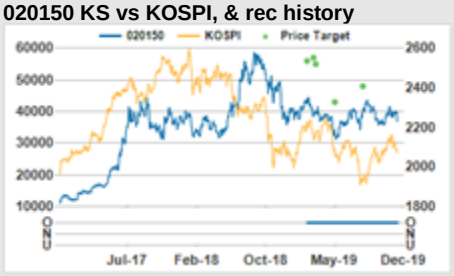
EPS = adjusted net profit / efpowa*
ROA = adjusted ebit / average total assets
ROA Banks/Insurance = adjusted net profit /average total assets
ROE = adjusted net profit / average shareholders funds
Gross cashflow = adjusted net profit + depreciation
*equivalent fully paid ordinary weighted average number of shares

All Reported numbers for Australian/NZ listed stocks are modelled under IFRS (International Financial Reporting Standards).

Recommendation proportions – For quarter ending 30 September 2019

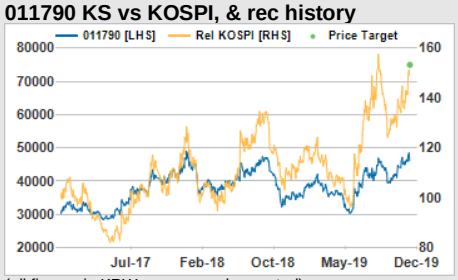
	AU/NZ	Asia	RSA	USA	EUR	
Outperform	43.12%	58.72%	48.53%	52.06%	54.02%	(for global coverage by Macquarie, 3.09% of stocks followed are investment banking clients)
Neutral	39.49%	28.86%	41.18%	44.19%	37.50%	(for global coverage by Macquarie, 3.35% of stocks followed are investment banking clients)
Underperform	17.39%	12.42%	10.29%	3.75%	8.48%	(for global coverage by Macquarie, 3.08% of stocks followed are investment banking clients)

020150 KS vs KOSPI, & rec history



(all figures in KRW currency unless noted)

011790 KS vs KOSPI, & rec history



(all figures in KRW currency unless noted)

Note: Recommendation timeline – if not a continuous line, then there was no Macquarie coverage at the time or there was an embargo period.
Source: FactSet, Macquarie Research, December 2019

12-month target price methodology

020150 KS: Won48,000 based on a PER methodology

011790 KS: Won75,000 based on a Sum of Parts methodology

Company-specific disclosures:
011790 KS: Macquarie Securities Korea Limited is an issuer of ELW/ELNs and a liquidity provider in SKC Ltd (011790.KS). Up to date information of our warrant position can be found here: http://kind.krx.co.kr/disclosure/disclosurebystocktype.do?method=searchDisclosureByStockTypeMain
Important disclosure information regarding the subject companies covered in this report is available publicly at www.macquarie.com/research/disclosures. Clients receiving this report can additionally access previous recommendations (from the year prior to publication of this report) issued by this report's author at https://www.macquarieinsights.com.
Target price risk disclosures:
020150 KS: Any inability to compete successfully in their markets may harm the business. This could be a result of many factors which may include geographic mix and introduction of improved products or service offerings by competitors. The results of operations may be materially affected by global economic conditions generally, including conditions in financial markets. The company is exposed to market risks, such as changes in interest rates, foreign exchange rates and input prices. From time to time, the company will enter into transactions, including transactions in derivative instruments, to manage certain of these exposures.
011790 KS: Any inability to compete successfully in their markets may harm the business. This could be a result of many factors which may include geographic mix and introduction of improved products or service offerings by competitors. The results of operations may be materially affected by global economic conditions generally, including conditions in financial markets. The company is exposed to market risks, such as changes in interest rates, foreign exchange rates and input prices. From time to time, the company will enter into transactions, including transactions in derivative instruments, to manage certain of these exposures.
Sensitivity analysis:
Clients receiving this report can request access to a model which allows for further in-depth analysis of the assumptions used, and recommendations made, by the author relating to the subject companies covered. To request access please contact insights@macquarie.com.
Analyst certification:
We hereby certify that all of the views expressed in this report accurately reflect our personal views about the subject company or companies and its or their securities. We also certify that no part of our compensation was, is or will be, directly or indirectly, related to the specific recommendations or views expressed in this report. The Analysts responsible for preparing this report receive compensation from Macquarie that is based upon various factors including Macquarie Group Ltd total revenues, a portion of which are generated by Macquarie Group's Investment Banking activities.
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This publication was disseminated on 05 December 2019 at 10:51 UTC.