

Investors' Meeting for Business Strategy  
for the Energy & Functional Materials Sector  
Q&A Summary

Date and time: Tuesday, September 26, 1:30 to 2:45 p.m.  
Presenter: Hiroshi Ueda, Representative Director &  
Senior Managing Executive Officer

Heat-Resistant Separators

**Q. It seems you rely to an extremely high degree on just one major North American automobile manufacturer in your separator business, so do you plan to expand to new customers going forward? Also, your production capacity for the base film is not that large, so I would like to ask about your future investment plans.**

A. As I said earlier, the reason for our strong reliance on one company is that we are sharing in our customer's business and strategy, with our company adopting this strategy for handling business. Other companies understand the advantages of aramid separators, and a number of companies have decided to adopt them. As for investment in the base film, we are considering deploying facilities with better productivity than our current facilities, and we are working to develop new production equipment. In addition, we are currently in talks with customers about when to engage in this investment.

**Q. You just said that several companies had decided to adopt your separators, but how much potential does this business actually have?**

A. Currently, demand from the US automobile manufacturer is strong, so we have no spare supply capacity. This is why the amount that we can supply to other companies is only a small percentage of our total production capacity.

**Q. The US automobile manufacturer has decided to use your aramid separators through its current models, but is there a high chance that you will also supply the separators for the SUVs that are planned to be announced next?**

A. I cannot speak to details, but we are in talks about upcoming models. We are still in the initial discussion phase, but Sumitomo Chemical has ten years' experience in supplying aramid separators, and we have earned trust in not causing any quality problems in the time we have been supplying them. For this reason, we are currently the first company people talk to when developing new car models. Supply structure and costs are yet to be decided, but they have a strategy for further expansion going forward.

**Q. You have said you will be expanding separator production capacity to 400 million square meters a year, but I would like to ask about your vision for further production capacity expansion beyond that.**

A. An executive at the US automobile manufacturer has explained that they have a multipronged vision of the future. We are told that the annual production capacity for lithium-ion batteries at the Gigafactory is 35 gigawatt-hours (GWh), but that they will expand this to 50 GWh or even 100 GWh. In order for us to support 35 GWh/year in lithium-ion battery production, we will expand separator production capacity to 400 million square meters a year. If they are going to double their production capacity for lithium-ion batteries, then a further 400 million square meters a year will be necessary. An investment of tens of billions of yen will be necessary to increase separator production capacity by another 400 million square meters a year. After sharing our business strategy with our customers, we would like to make that investment if necessary.

**Q. Ceramic separators beat aramid separators on cost, so how will you be reducing costs going forward, and how do you plan to differentiate?**

A. It is said that aramid coating is high cost, but we are researching a number of possible rationalizations to bring that down. Because ceramic separators require a certain level of thickness to ensure safety, the difference in costs with aramid separators is not as great as you might think. We are also currently researching production methods to significantly increase productivity for the base film, and we would like to deploy facilities using this method in our investments for the next period.

**Q. How do you plan to improve the profitability of the separator coating?**

A. Of course we are trying to rationalize the supply of raw materials, and we are working to improve the productivity of coating equipment. If we can reduce the amount of coating equipment required from ten machines to five, our cost competitiveness will increase.

**Q. I understand you are working to increase your number of suppliers for the base film for the aramid separators, but what efforts are you making to make sure that the quality of the separators remains consistent while using base film from a variety of manufacturers?**

A. Currently, we are procuring base film from a number of companies, but as you pointed out, there are differences in manufacturing methods and quality between the various manufacturers. Sumitomo Chemical uses a base film with different characteristics, using certain technology to produce separators of even quality.

**Q. I understand that there are a growing number of companies in China using a wet method to produce separators, but that there is still a quality gap compared to Japanese companies. Is there a future possibility of perhaps procuring base film from Chinese manufacturers while producing aramid separators internally?**

**A. We view the stability of quality as essential in procuring base film. It is not good enough for just a portion of the base film to be of good quality; we require that all the film delivered be of good quality.**

I believe there are only a handful of manufacturers around the world that can provide separators of that level of stable quality. We cannot predict whether, or to what degree, the quality of base film from Chinese and other new manufacturers will stabilize in the future, but if it does, we would like to consider using it.

**Q. It seems that the profitability of your separator business is low compared to other companies in the same industry, but is this due to the fact that your business is still at a relatively small scale? Or is it because the cost of specific components is high? If after, say, five years, your business has grown to some degree, and you have achieved improvements in productivity, what degree of profit do you think this business will produce? I would like to ask about both the reasons for the current low profit margin and your future prospects. Because this is a sector with high-performance businesses, I would like to ask what percentage profit margin you envision as you invest in this area.**

**A. We have set prices for our separators strategically, with a view toward creating a new era for our separator business. We decided to prioritize increasing sales volume over maintaining high prices. For this reason, our profit margin has gotten a bit low. Because we also have some room to improve in our manufacturing process, we are currently pursuing rationalizations. Our separators are products with extremely specialized features, but they may not have widespread appeal. For this reason, the degree to which the customers who have understood the benefits of our product and adopted it expand their businesses will become a major point in our own business. As for profit margin, there is some market competition, but we would like to aim for double digits.**

## Cathode Materials

**Q. On slide 11, you show the market for automotive lithium-ion batteries reaching 6 trillion yen by 2025, but how are you taking the problem of limited supplies of rare metals into consideration? In particular, there are worries about insufficient supplies of cobalt, but a higher proportion of nickel will be used in cathode materials, so do you think this insufficient supply of raw materials will not impact the production of lithium-ion batteries?**

**A.** In order for the lithium-ion battery market to reach 6 trillion yen by 2025, growing by seven times over the ten years from 2015, the reuse of resources will be necessary. Battery manufacturers may have to adopt a strategy of not only building battery factories in places where batteries will be used, but also of building recycling factories. As you pointed out, a response to limited resources will be necessary, and part of that will have to be the collection and reuse of cobalt.

**Q. I understand that your next development goal in cathode materials is a nickel-cobalt-manganese ratio of 8:1:1, but I would like to ask if you are confident that this will be adopted for cathode materials in batteries for electric vehicles beginning in 2020.**

**A.** Currently, high-nickel cathode materials in mass production use a ratio of more than 80% nickel, while some cathode materials in development use over 90% nickel. In order for cathode materials to increase the energy density of the battery, it is important to make cathode precursor materials with precise crystal structures. The selection process for cathode materials for use in automotive batteries that will begin mass production around 2020 is ongoing, and we aim to have our cathode materials adopted for this generation of batteries.

Q. On slide 24, you explained the generational changeover in cathode materials, but will you be able to make full use of the strength of Tanaka Chemical's cathode material precursor manufacturing due to the generational changeover? I would like to ask about your background to your forecasted expansion in the adoption of cathode materials going forward.

A. As generations advance, the methods for forming crystals in cathode materials become more important. It is not only the size of the crystals, but also factors such as their resistance to breaking that are essential, and these are determined by the methods of making the precursor materials. I would like you to understand that precursor materials are not simply the raw materials of cathode materials; they are important elements that determine the functionality of the cathode materials. Tanaka Chemical has been producing precursors for a long time, since the era of nickel-metal-hydride batteries. Because they have built up a large store of research into the production of nickel-based precursors, they create extremely precise particles. You may think this is just about the size of the particles, but Tanaka Chemical has technology to manufacture precursors with excellent properties, including a lack of impurities and consistency in flow distribution.

**Q. Your company has taken a stake in Tanaka Chemical, but was this in order to create synergies that would give Tanaka Chemical the strength to make a significant investment? Can we expect synergies from the product combination of cathode materials and separators?**

A. As we expect rapid growth in the market for automotive lithium-ion batteries, battery manufacturers and automobile manufacturers are looking to tie up alliances along their supply chains. Supply chains are in the midst of being decided, as automobile manufacturers look at where they will buy batteries, and battery manufacturers look at where they will buy cathodes and separators. There is demand for high quality in separators, and if metals are mixed in during the manufacturing process, for example, the products will have extremely undesirable properties. We work to prevent contamination with foreign metal particles in the manufacturing process of separators by maintaining a perfectly clean environment and strengthening an inspection system. The question of how to make batteries that have the high levels of energy required for automotive applications, and of how to ensure quality, is a question that encompasses all parts of the process, including separators and cathode materials. In addition, by offering both separators and cathode materials, our customers can approach us from a variety of different angles, so there is the possibility of utilizing synergies on the side of taking orders as well.

#### Super Engineering Plastics (SEP)

**Q. It seems that your SEP product lineup is a bit small compared to other companies in the same business, but what are your thoughts?**

A. There are other companies in this business expanding their own lines of SEPs and other engineering plastics. Our company would also like to find good materials and add them to our lineup, but we are not looking to just increase the number of products, but to narrow them down to those which we can make good use of. Currently, our lineup consists of the three categories of polyethersulfone (PES), liquid crystal polymer (LCP), and polyether ether ketone (PEEK) products sold through alliances with other companies.

**Q. With SEPs, what sort of market are you targeting?**

A. In today's presentation, we focused our explanation on automotive applications, but PES can also be used for applications, including aerospace applications, food containers, and dialysis membranes. Prices are varied because it is an extremely big market, but we are targeting higher-priced applications, one of which is automotive applications. Within the category of automotive applications, we would like to target customers who understand the outstanding characteristics of PES, and who are willing to buy it even at a higher price.

**Q. I believe European companies such as BASF and Solvay may compete with you in PES, but why is your company's market share not very large yet in automotive applications, despite having a large market share in aerospace applications? Also, what efforts are you taking to increase your market share going forward?**

A. As you pointed out, we have put a great deal of effort into the aerospace application market, while BASF and Solvay have been developing their business through broader applications. We would like to apply the technology developed in producing for aerospace applications, and expand it into other applications as well.

#### Others

**Q. What is your forecast for orders for the CO<sub>2</sub> separation membranes going forward? I would like to ask about the timing of this product's contribution to sales, including whether you expect further orders during the current Corporate Business Plan.**

A. The CO<sub>2</sub> separation membranes that have already been delivered are contributing to saving energy in the CO<sub>2</sub> separation process at factories, but due to the lower price of oil, the economic benefits are not what we had initially hoped. However, it is said that the era of carbon taxes (carbon pricing) will be arriving soon, and when that happens, the processing of CO<sub>2</sub> emissions will become an issue. In light of this, we are working on research that is a bit more long-term. Beyond this, we are working on a variety of joint development projects on uses for CO<sub>2</sub> separation membranes outside factories.



**Q. On slide 7 you show the Sector's product lines and state your intention to devote management resources and proactively expand your business in areas where the market growth rate is high, but outside of those areas, would you consider entering into alliances as you have done with S-SBR?**

A. For S-SBR, it has been six months since we established ZS Elastomers as a joint venture with Zeon Corporation, and we are beginning to generate synergies, both in terms of sales and technology development. To give you a slightly detailed explanation of the technology, we are trying to bring together Zeon Corporation's coupling technology with our chain modification technology. Because electric vehicles are heavy, there is a need to increase the wear and abrasion resistance of tires. European tire manufacturers, in particular, want to increase the wear and abrasion resistance of tires, so we need to develop high molecular weight S-SBR. By bringing together the technologies of the two companies, we are in the process of developing a polymer that has greater wear and abrasion resistance.

For alumina, we have been working to rebuild our business since 2015, but a competitor exited the business this year, and we are getting more customer enquiries. For alumina, as well, rather than commodity products, we are targeting value-added applications. Our low-soda alumina is used in semiconductor manufacturing equipment, receptacles, and conveyors, and demand is increasing. In addition to our efforts to streamline our operations, new applications are expanding, and a competitor is exiting, so the business is benefiting from positive trends.

For resorcinol, one large US manufacturer suddenly exited the business, so we are getting very strong enquiries, and we expect a significant increase in sales this fiscal year. Because our supply capacity is limited, we decided to increase our capacity by about 2,000 tons. To our current capacity of 20,000 tons at our Chiba Works and 10,000 tons at our Oita Works, we will slightly expand by 2,000 tons.

For rubber chemicals, demand is increasing for our silane coupling agent, a rubber additive that increases the wear and abrasion resistance of rubber.

For EPDM, currently there is an over-supply in world markets. Under the slogan "EPDM that is not EPDM," we are working to create high-performance EPDM that can serve as a substitute for chloroprene

rubber or silicone rubber. General-purpose EPDM will be produced at Petro Rabigh.

**Q. Your goal for sales for fiscal 2018 is 300 billion yen, with operating income of 18.0 billion yen, but that level of profitability seems a bit low. As you are the Functional Materials Sector, a profit margin in the double digits should be imperative, so I would like to hear your thoughts on improving profitability.**

A. We expect that competition in the battery components business will be getting fiercer. At the same time, there are some businesses we have been operating for some time that achieve profit margins in the double digits, where we would also like to further improve profitability. There are businesses where competition will be getting more intense, and businesses where we can expect improvements in income, but overall we would like to further improve our profitability.

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#### Cautionary Statement

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