PRESS RELEASE

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Zeon begins verification of secure computation technology for inter-company linkage of experimental data, drastically expanding AI model capabilities and opening up new avenues for value creation

Zeon Corporation

Zeon Corporation (Zeon; head office: Chiyoda-ku, Tokyo; President and CEO: Tetsuya Toyoshima) has succeeded in linking experimental data of two companies and has also verified that the data linkage resulted in enhancing the physical property prediction capability of the newly constructed AI model. Zeon will further advance this initiative to incorporate secure computation technology*1 into the process. Once established, the technology will not only facilitate the confidential sharing of data between companies but also realize an AI with highly accurate predictive capabilities that is expected to create new value, transcending the separate efforts of other companies, by vastly accelerating and improving the efficiency of research and development.

1. Background of initiative

Currently, the data accumulated by companies in Japan's materials industry is only being used within their own data platforms. Bolstering international competitiveness, however, depends upon the ability to aggregate and use data beyond the confines of companies and industries. At the same time, data confidentiality and enhanced prediction accuracy are vital for linking and using uniquely different data sets.

Zeon introduced materials informatics (MI) to its experimental data in 2021, primarily at its Research & Development Center, for the purpose of constructing a data platform for deploying AI models reinforced by data linkage between companies via a secure connection. In 2023, we began verifying the application of secure computation technology to MI. The latest development successfully linked data between companies while remaining within parameters that did not involve secure computation technology, yet still confirmed the enhanced prediction capability of the resulting AI model. This means we were able to partially demonstrate the feasibility of the above concept and gain a major incentive to take on the next step for implementing secure computation technology.

2. Results of latest verification

We achieved the following results from the verification.

(1) Data linkage between companies and visualization based on the use of AI models

We succeeded in linking experimental data on synthetic rubber between Zeon and Zeon Chemicals L.P. (ZCLP; State of Kentucky, USA; President and CEO: Michael Recchio). While ZCLP is a Zeon Group company engaged in the manufacturing and development of elastomers, its data management is completely independent from Zeon, so the linkage of experimental data can be regarded as an example of virtual data linkage between separate companies.

For example, even when compound types and naming rules differ, we were able to apply our proprietary conversion program to achieve data linkage. Compounding agents unique to ZCLP, and not found in Zeon's database, were linked by researching scientific data, such as the ingredients and basic physical properties, to enhance the quality of the database after the linkage, resulting in a database of compounding recipes with over 7,000 levels.

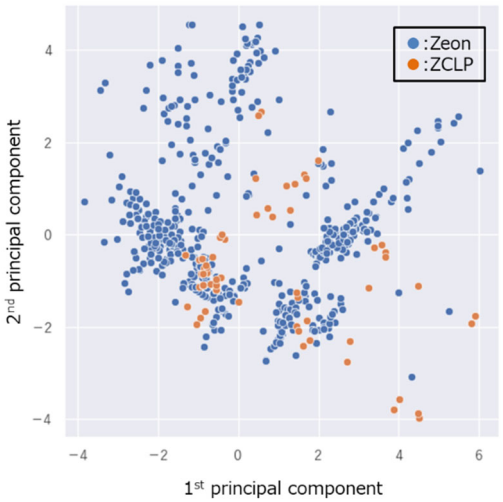

Diagram 1: Map of principal components of Zeon and ZCLP

We were also able to visualize the data distribution by performing principal component analysis on the data sets of the two companies before and after data linkage. As shown in Diagram 1, the two data sets complement their respective weak areas, although the areas themselves are not too far apart, thereby indicating the effectiveness of the data linkage.

(2) Enhanced predictive capability of AI models based on data linkage

After linking the data of the two companies, as described above, we used AI models trained on this linked data to compare the predicted and actual values of the rubber's hardness. As a result, we confirmed that the accuracy of analysis based on the linked data was higher than that of the analysis based on the data of either company alone.

Diagram 2 plots the actual values vs. predicted values for ZCLP data using AI models trained on various combinations of Zeon and ZCLP data. Case ① used half of the ZCLP data for training, case ② used all of Zeon's data for training, and case ③ used data from both Zeon and ZCLP. We confirmed that the AI model trained on the linked data in case ③ had the smallest root mean square error (RMSE) and showed improved accuracy.

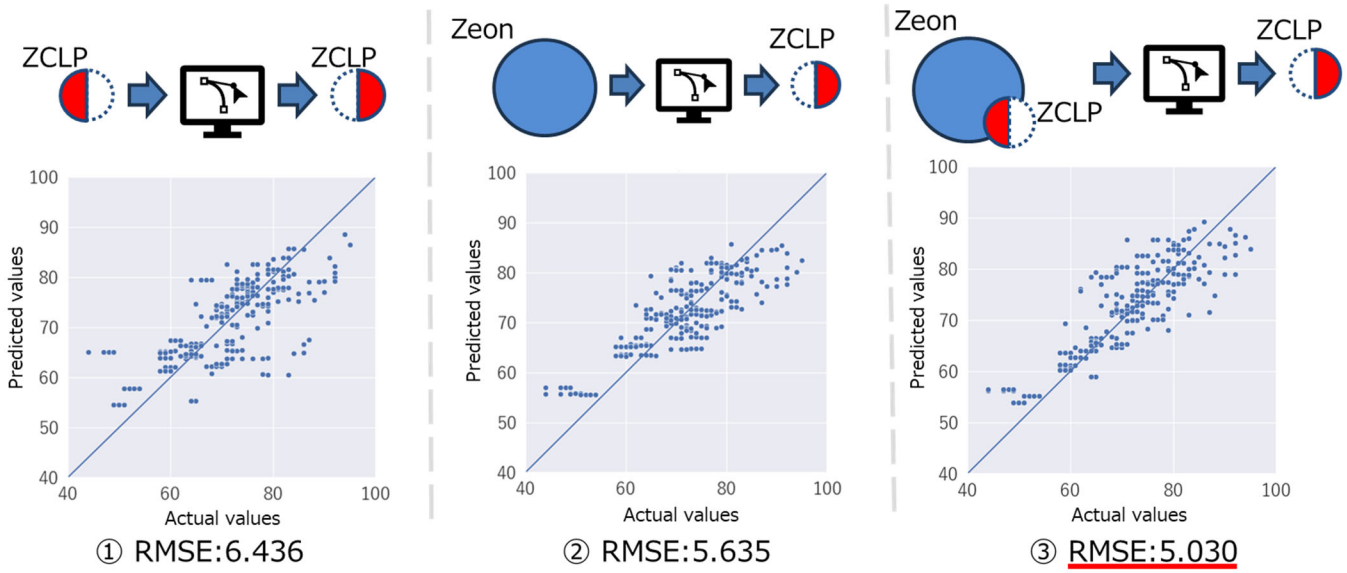

Diagram 2: Plots of actual values vs. predicted values of the AI models and the respective root mean square error

*Root Mean Square Error (RMSE): A measure of the difference between the value predicted by a model and the observed value. The smaller the value, the better the model's performance.

3. Future outlook

We will proceed with a full-scale verification of secure computation technology to ensure confidentiality, which poses the greatest obstacle to inter-company data linkage, in collaboration with SB Technology Corp. (head office: Shinjuku-ku, Tokyo; President and CEO: Shinichi Ata). Specifically, we will construct an actual system for linking data and conducting AI analysis via TEE*2, a type of secure computation technology, to confirm the feasibility by reproducing the results of the recent verification.

With its preeminent position in synthetic rubber, Zeon believes that it can offer unprecedented value by first building a confidential data platform for the industry to aggregate research and development data from a broad range of rubber-related companies. This initiative, which can also be applied to materials beyond rubber, opens the possibility of expanding to other sectors in the future, creating new business opportunities.

Roadmap

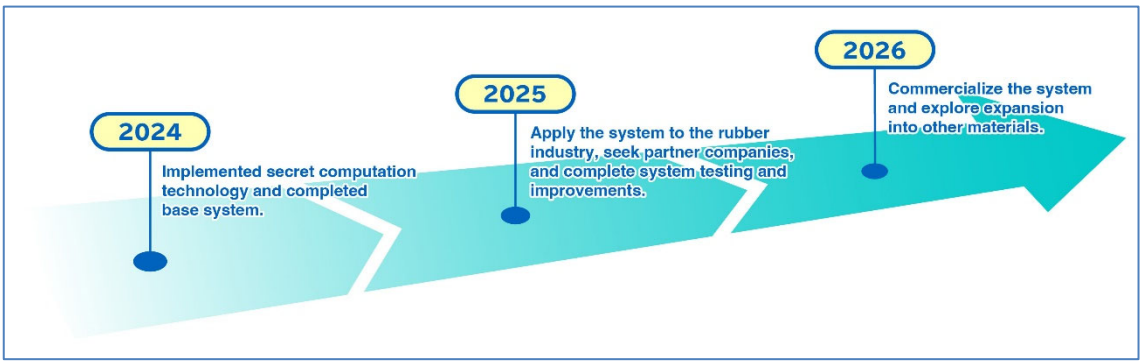

Diagram 3: Image of two companies sharing an AI model that has been vastly enhanced in capability by providing each other's experimental data in encrypted form

Zeon aspires to help realize a "Sustainable Earth" and a "Safe and Comfortable Life" by providing products and services created using our original technology. To this end, we will take action beyond the confines of our own operations, spearheading efforts to achieve higher efficiency in research and development and innovate business models while also contributing to further growth by involving the entire supply chain.

*1 Secure computation technology: Technology for performing computational processing using encrypted data. This enables secure execution of computational processing while maintaining data confidentiality.
*2 Trusted Execution Environment: A type of hardware-based technology for secure computation, it provides the required secrecy for data and securely executing programs to process data within an isolated area of execution inside hardware.

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