CAE Advanced Composite Materials and Structures Research Division

- Project Term: April 2018 ～ March 2021
- Members:

Department of Mechanical Engineering Professor S. Ogihara (Division Head)
Department of Materials Science and Technology Professor Y. Kogo
Department of Mechanical Engineering Professor H. Okada
Department of Pure and Applied Chemistry Professor K. Arimitsu
Department of Mechanical Engineering Associate Professor A. Takahashi
Department of Mechanical Engineering Associate Professor R. Matsuzaki
Department of Materials Science and Technology Associate Professor J. Koyanagi
Department of Materials Science and Technology Assistant Professor R. Inoue
Department of Mechanical Engineering Assistant Professor Y. Yusa
Department of Mechanical Engineering Assistant Professor R. Kitamura

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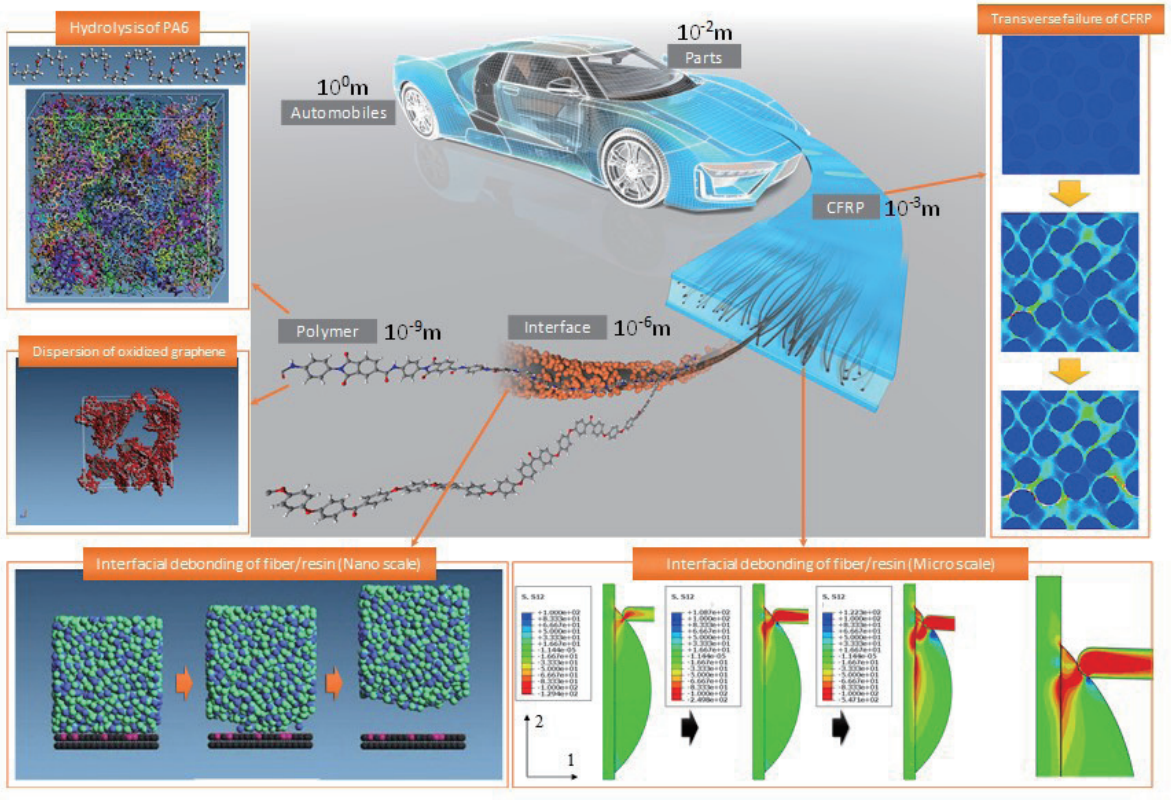
Target, Aim, and Future Prospective:

Here at the CAE Advanced Composite Materials and Structures Research Division, we aim to establish strong academic—industry collaboration by effectively utilizing computer-aided engineering (CAE) software to (1) conduct engineering research through the development of materials at the molecular level (via the molecular orbital theory and molecular dynamics method) and (2) design actual structures or execute molding simulations and fracture analysis from destruction simulators (which employ the finite-element method and particle method). Because the members of our research division can cover a wide range of materials and structures, as shown in the figure in next slide, it is possible to increase their suitability for the needs of the industry. In other words, the division will become a major receiver to entrust with and take on collaborative research. Through this research, the division will improve the brand recognition of Tokyo University of Science in Japan by deploying a large number of well-trained, well-equipped CAE engineers for the industry where they will make great contributions.

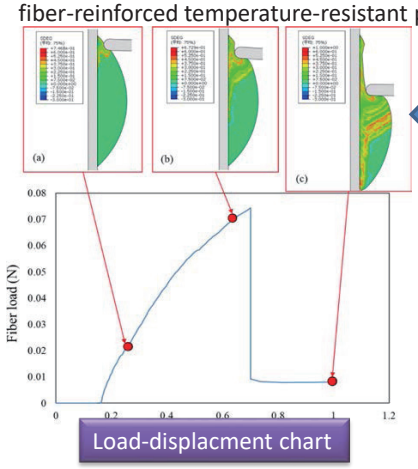
The CAE Advanced Composite Materials and Structures Research Division aims to:
- Conduct research focused on composite materials, which are undeniably the material of the 21st century;
- Build strong relations with industry through engineering research utilizing CAE technology (which has become mainstream in recent years);
- Apply the motto “be equipped” when cultivating CAE engineers, the demand for whom has grown in recent years, and preparing them for industry support.

Multiscale Analyses on Going



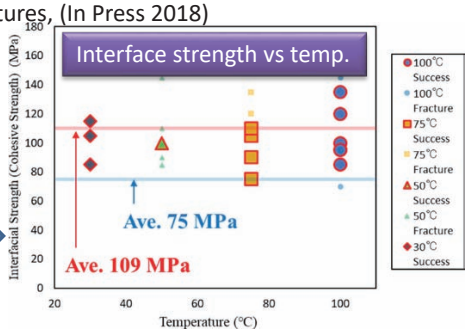
Publications in 2018

[1] M. Sato, Jun Koyanagi, X. Lu, Y. Kubota, Y. Ishida, T.E. Tay, Temperature dependence of interfacial strength of carbon-fiber-reinforced temperature-resistant polymer composites, Composite Structures, (In Press 2018)



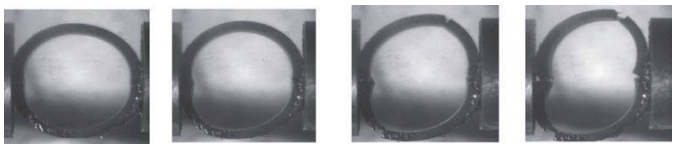
High-fidelity numerical modeling for interface evaluation test.

Interface strength is independent of temperature.



The fiber/matrix interface is the most critical issue for composite materials. In this study, we established new evaluating method of interface strength using CAE technique.

[2] Yuta Yamazaki, Jun Koyanagi, Y. Sawamura, Muhammad Ridha, S. Yoneyama, T. E. Tay. Numerical simulation of dynamic failure behavior for cylindrical carbon fiber reinforced polymer, Composite Structures, (In Press 2018)



The failure of CFRP is complicated because it consists of accumulation of fiber failures, matrix cracks, and interface failures so that the numerical modelling is not easy.

High-fidelity numerical modeling is done for impact failure test of CFRP rings.