

Title **Multiscale Simulation of Friction and Wear****Speaker** Prof. Hitoshi Washizu
Graduate School of Simulation Studies, University of Hyogo**Time& Date** 1:00 PM (JST), Wednesday, March 19th, 2025**Abstract**

Tribology is a technology and science about the physics and chemistry between two sliding surfaces, such as friction, wear and lubrication. Although control of friction of machine elements is essential for both economy and ecology, understanding of friction is still an open question. In this talk I will introduce our multi-scale material simulation for both solid and soft materials, such as coatings and oil. To reproduce the multi-scale nature of the oil, i.e. solution of base oil with super molecules, such as grease, polymer and polar additives, we made a simulator which couples Brownian dynamics of molecules with fluid dynamics (BDLBM). For the analysis of solid friction, we made a coarse-grain simulator based on smoothed particle hydrodynamics (SPH). The solid materials are modeled as ensemble of coin like particles, and both elastic friction and friction including elastic plastic deformation are treated. For the material modeling of multi-scale simulator, all atom molecular dynamics simulation is also used. The mechanism of viscosity control of polymer additives are solved using BDLBM simulator. The origin of flash temperature is found using the SPH simulator. We then apply these techniques to estimate the friction and wear of environmental friendly applications such as wind turbine bearing, bearing of electric vehicles.

About the Speaker

Prof. Washizu is a Professor in Graduate School of Simulation Studies at University of Hyogo. He received B.S. degree from Tokyo Institute of Technology in 1996, M.S. degree in 1998 and Ph.D. degree in 2001 from the University of Tokyo. His Ph. D. thesis was about molecular simulation of polymer solution, at the physical chemistry lab. He started as a Tribologist at Toyota central R&D Labs. from 2001. He also joined national projects from 2003 to now about next generation super computation, and element strategy projects. He is also research center researcher (2012), and professor (2015) at the Elements Strategy Initiative for Catalysts and Batteries (ESICB), Kyoto University. He moved from industry to university in 2015. He is a chair of the organizing committee of the International Tribology in 2027 Himeji.

Registration https://zoom.us/webinar/register/WN_Ha9qODS_RMONEOgFdGzHJQ**Host** Prof. Yoshinori Sawae**Contact** I²CNER • Q-PIT Office of Research Support Services,
Research Support and Public Relations
TEL: +81 92 802-6935
Email: iq-kenkyu@jimu.kyushu-u.ac.jp