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MATERIALS GENOME INITIATIVE SEMINAR SERIES

Bio-inspired Self-Healing Ceramics for Turbine Blade Applications

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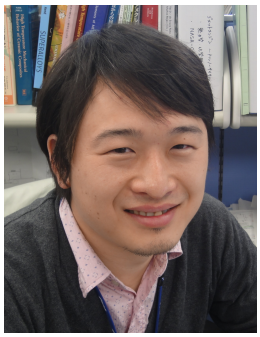
CHiMaD Headquarters, Hogan 1160 (1st Floor)

ABSTRACT Self-crack-healing is one of the most valuable bio-inspired phenomena to overcome the reliability degradation of structural ceramics that are caused by cracking in service. The reason is that the self-healing is triggered by crack initiation itself and autonomically attains complete strength recoveries through the high temperature oxidation of SiC. The feature allows the self-healing ceramic to be an attractive candidate for next generation high-temperature materials which can be used as gas turbine components, i.e., turbine blade and stator vane. In this seminar, we introduce the self-healing behaviors of the oxidation-induced self-healing ceramics such as Alumina/SiC composites. Then, we discuss the mechanism and possible models of strength recoveries by self-healing together with its potential application as turbine blade.



Dr. Toshio Osada *is a researcher at the Structural materials Unit in National Institute for Materials Science (NIMS), Japan. He received his Ph.D. from Department of Materials Science and Engineering at Yokohama National University (YNU) in 2009. After working at high temperature material center in NIMS as a postdoctoral researcher, he worked at YNU as an assistant professor before returning to NIMS as a researcher. Dr. Osada published more than 30 papers related to the research on high temperature materials such as Ni-Co base superalloy [1] and self-crack-healing ceramics [2] for the jet engine turbine disk and blade applications.*

[1] Osada et al. "Optimum microstructure combination for maximizing tensile strength in a polycrystalline superalloy with a two-phase structure" Acta Materialia, 61, (2013) 1820-1829.
[2] Osada et al. "Self-crack-healing behavior in ceramic matrix composites", Advances in Ceramic Matrix Composites, Woodhead Publishing Ltd, (2014) 410-441