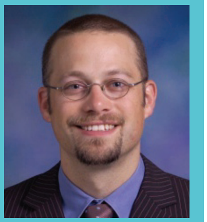
東京大学グローバルCOEプログラム　機械システム・イノベーション国際拠点　東京大学 THE UNIVERSITY OF TOKYO

GMSI Global Center of Excellence for Mechanical Systems Innovation

第72回　GMSI公開セミナー

Imaging Nanofunctionality: field assisted sintering and dielectric breakdown in the TEM

Professor　Klaus van Benthem



University of California, Davis
Benthem@ucdavis.edu

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会場：東京大学工学部9号館　1F 大会議室

要旨

Transmission Electron Microscopy has enabled the direct imaging of microstructural details of materials. The recent advent of aberration correction for Scanning Transmission Electron Microscopy (STEM) provides tools for the structural and chemical characterization of defect structures with sub-Ångström spatial resolution and single atom sensitivity. Novel *in situ* STEM techniques available in our laboratory will be discussed during the presentation that offer capabilities to characterize the evolution of atomic-scale defect structures under applied stress, such as heat and heating rates, electrical fields and currents.
We have applied electrical stress to ultrathin dielectric films to investigate atomic scale dielectric breakdown mechanisms that are relevant for the performance of field effect transistors. First results indicate the formation of areas in which dielectric breakdown induced epitaxy forms a conductive pathway across the dielectric thin film.
The application of electrical fields combined with heating rates of several hundred centigrade per minute was shown to be an effective pathway for the rapid consolidation of nanometric powder particles to obtain microstructures achieving 100% of their theoretical density. Such microstructures demonstrate exciting new properties due to grain sizes that often remain below 100nm. During my presentation I will discuss how we are currently applying in situ TEM/STEM techniques to identify the fundamental atomic scale mechanisms that lead to rapid densification while grain growth is suppressed.

主催：　東京大学グローバルCOEプログラム「機械システム・イノベーション国際拠点」
本件連絡先：　東京大学大学院工学系研究科 総合研究機構ナノ工学研究センター　教授　幾原　雄一
E-mail: ikuhara@sigma.t.u-tokyo.ac.jp　Phone: 03-5841-7688
GCOE事務局　E-mail: gmsi-office@mechasys.jp　Phone: 03-5841-7437