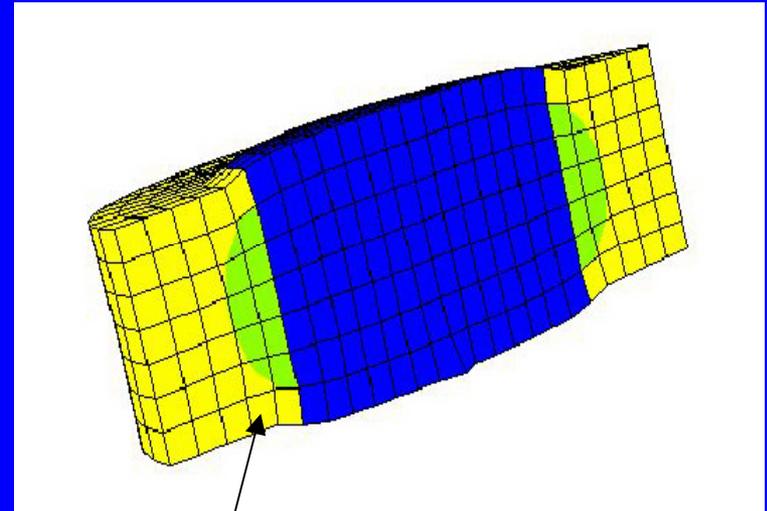


Promising Results on Multi-Scale Modeling of Sintering

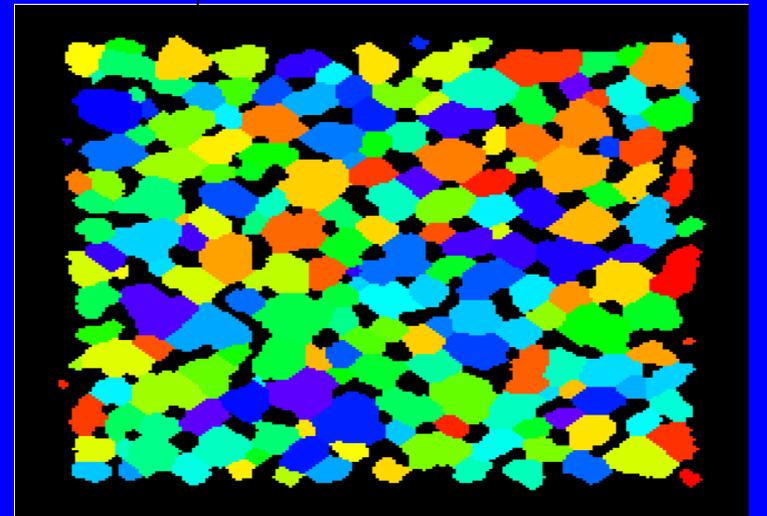
Prof. Eugene Olevsky, San Diego State University, DMR-0313346

The first multi-level meso-macro-scale theory of diffusion-induced deformation processing of particulate materials, such as sintering, is being developed. An innovative parallel computing procedure for linking different material scales has been elaborated. This allowed the reduction of a cumbersome and expensive experimental analysis of material properties at various length scales. The pore-grain structure evolution **at the mesoscopic scale** corresponds to the evolution of properties of each finite element **at the macroscopic scale**. As an example, the problem of sintering with an inclusion, important for the optimization of the fabrication of electronic circuitry (e.g. sintering with vias) is successfully solved in collaboration with Sandia National Laboratories.



Macroscopic Modeling: Sintering with Inclusion

Mesoscopic unit cell = finite element

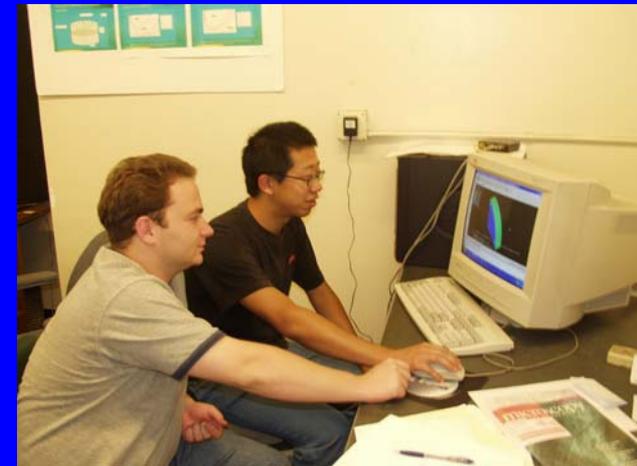
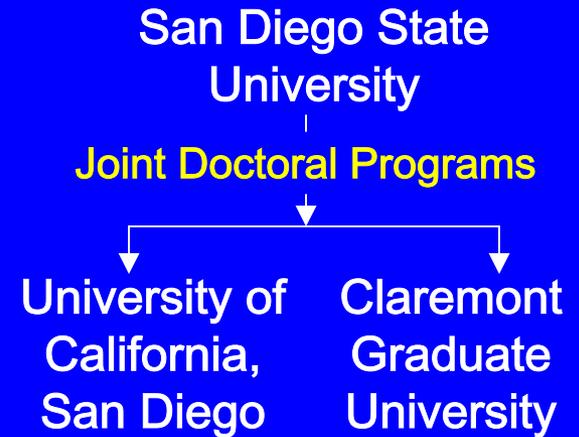


Mesoscopic Simulation: Sintering and Grain Growth

Development of Two Joint Doctoral Programs

Prof. Eugene Olevsky, San Diego State University, DMR-0313346

The project contributes to the development of the two Joint Doctoral Programs: between San Diego State University and University of California, San Diego (in Applied Mechanics and Materials Science) and between San Diego State University and Claremont Graduate University (in Computational Materials Science). The supervised by PI Ph.D. students in the framework of both Doctoral Programs learned the fundamentals of the continuum modeling of sintering and participated in the development of finite-element sintering-simulation program codes. They also studied the fundamentals of the constitutive micromechanical modeling of diffusion-induced processes. The students already co-authored 6 publications including 2 papers in refereed journals. They will present their research results at the IMAPS and SAMPE annual meetings in Fall 2004.



Ph.D. Students B. Kushnarev (SDSU-CGU JDP) and X. Wang (SDSU-UCSD JDP) explore virtual reality of sintering