

GMSI Open Seminar

Segregation of Impurities to Grain Boundaries in Ceramics

by

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The properties of polycrystalline materials depends often on impurities or second components segregated to grain boundaries (GBs) in the poly-crystalline materials. The segregated elements may enhance or decrease the bonding of the juxtaposing grains. Example for different materials will be shown. The presence of impurities and second phases in ceramics (e.g., α -Al₂O₃, Si₃N₄ materials) leads also to alterations of properties such as fracture, grain growth and GB diffusion. Advanced analytical transmission electron microscopy (A-TEM) allows the determination of small amounts of segregants with high spatial resolutions.

TEM results obtained for specific low energy GBs demonstrate that the propensity of segregations depends also on the energy of the “clean” GB: low GB energies allow less segregation than high energy GBs. The experimental results are being compared to results of theoretical calculations.

Dillon et al (Acta Mat **55** (2007) 6208) introduced a new concept, the *interface complexions*. They offer a missing link to get a grasp of the segregation phenomena for more general boundaries. The *complexions* were predicted theoretically by thermodynamics and were recently also be proven by indirect evidence for different materials after different heat treatments. Direct imaging by high-resolution TEM of the *complexions* was so far not possible owing to geometrical constraints required for HRTEM.

March 27 (Friday), 2009 14:00 -16:00

Main meeting room at Institute of Engineering Innovation, UT
(工学部総合研究機構 9号館1階 大会議室)

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