MM 44: Invited talk Sandloebes

Time: Wednesday 18:30–19:00 Location: H38

Invited Talk MM 44.1 Wed 18:30 H38

Design of ductile Mg alloys based on combined high resolution electron microscopy experiments and ab initio calculations — •Stefanie Sandlöbes[1,2], Martin Friák[1,3], Zongrui Pei[1], Talal Al-Samman[2], Sandra Korte-Kerzel[2], Jörg Neugebauer[1], and Dierk Raabe[1] — [1]Max-Planck-Institut für Eisenforschung GmbH, Düsseldorf, Germany — [2]Institut für Metallkunde und Metallphysik, RWTH Aachen University, Aachen, Germany — [3]Institute of Physics of Materials, Academy of Sciences of the Czech Republic, Brno, Czech Republic

Single phase solid solution Mg-Y shows an increase in room temperature ductility by about 5 times compared to pure Mg, while maintaining comparable strength and enabling stable work hardening. We show that the enhancement of the mechanical properties of Mg-Y alloys is caused by facilitated activation of additional deformation mechanisms providing a <c>-dislocation shear component. By employing complementary high-resolution electron characterization methods and ab initio calculations we identified the I1 stacking fault energy (SFE) as a guiding parameter for ductility in Mg alloys. Using the parameter SFE I1 we performed ab initio calculations and identified further favourable solid solution elements, rendered into both, binary and ternary alloys, which decrease the SFE I1 in Mg and, indeed, show increased room temperature ductility. We demonstrate that combining ab initio and advanced experimental characterization methods facilitates the identification and understanding of critical alloying and associated microstructure parameters as basis for advanced alloy design.