Séminaire PIMM

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GRAIN NEIGHBOR EFFECTS ON TWIN TRANSMISSION IN MG AND ITS ALLOYS

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The interaction between grain boundaries and twins has an important influence on the deformation behavior of hexagonal close packed (hcp) materials. In this presentation, we closely examine experimentally and numerically the interaction between deformation twins and internal microstructural boundaries. The analysis involves a combination of automated electron backscatter diffraction (EBSD) and full-field 3D spatially resolved, Fast-Fourier-Transform (FFT) mechanics modelling to study the influence of the localized shear effects of twin lamellae and other material and boundary characteristics (crystallography, active slip modes, etc.) on the stress distributions at twin/grain boundary intersections. Results from a large-data-set statistical analysis for both Mg and Zr suggest that whether or not twins transmit across grain boundaries depends not only on grain boundary crystallography but also strongly on the anisotropy of crystallographic slip. The modeling investigation further reveals that enhancing material plastic anisotropy or the spread in the CRSS values among the prismatic, pyramidal <c+a>, and basal slip systems increases the driving forces for twin transmission and the cut-off misorientation grain boundary angle above which twin transmission is not likely. We apply the insight gained to understand the effects of alloying on the likelihood of twin transmission within deformed polycrystalline Mg alloys.