**GRAIN BOUNDARY-BASED PLASTICITY MECHANISMS IN NANOSTRUCTURED METALS**

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The Hall-Petch relationship establishes the proportional dependency of a metal's strength with the inverse of its grain size's square root. This phenomena, is well understood using dislocation-based plasticity, until the grain size becomes too small. There plastic deformation mechanisms are usually related to grain boundaries (GBs). Previous studies have observed and simulated several plastic deformation mechanisms such as grain rotation, grain sliding and shear-migration coupling (Figure 1). Some models have been proposed to predict shear-migration coupling based on the initial GB misorientations[1], [4]. However, they have not yet been proven experimentally in the case of polycrystals. This study focuses on the shear-migration coupling, a mechanism which has fueled many recent studies in the field of plasticity [1], [2], [3]. To carry it out, we use polycrystals of Aluminum, Copper and Nickel, with ultrafine grains (<1µm). We aim to find experimental evidences of such mechanism and characterize it in order to correlate it with initial grain misorientations, straining rate, chemical distribution, etc.

Transmission Electron Microscopy (TEM) analyses are combined with Automated Crystalline Orientation Mapping (ACOM-ASTAR) and *in-situ* straining experiments at room and high temperatures.
*In-situ* experiments are also carried-out with scanning tunneling microscopy in order to reach atomic resolution on grain boundaries and quantify the migration perpendicular to the surface of the sample.
We have already observed grain boundary migration and we aim to quantify it in the next steps of this study.

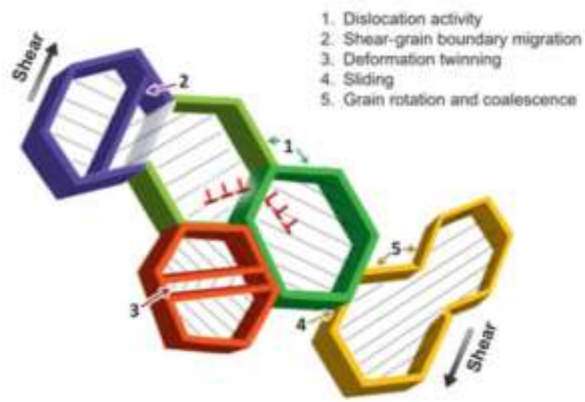


*Figure 1: Schematic of various plastic mechanisms that can occur in polycriystals (From [5])*

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