# PLASTIC DEFORMATION MECHANISMS IN FACE CENTERED CUBIC LOW STACKING FAULT ENERGY HIGH ENTROPY ALLOYS

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High entropy alloys (HEAs) are a group of metal alloys with interesting properties for a range of temperature down to cryogenic. In 3d transition metal HEAs simultaneous high strength and ductility has been reached. This has been attributed to the activation of deformation nanotwins as an additional mode of plastic deformation. Plastic deformation in this group of HEAs with low stacking faults energy (SFE) similar to other low SFE metals and alloys starts with dislocation slip and with the increase in stress, deformation twins nucleate and grow as an additional mode of deformation. There have been studies that experimentally and computationally looked at deformation twins and the effect of different parameters on their nucleation and growth in HEAs and other low SFE metals and alloys, for instance twinning induced plasticity (TWIP) steels. However, the effect of grain boundary types and elemental segregation at grain boundaries have not been fully studied. In this research experimental and computational approaches are used to further identify the underlying plastic deformation mechanisms in HEAs giving rise to their improved properties. High resolution digital image correlation and electron backscatter diffraction has been used to find the dislocation slip critical resolved shear stress in $Al_{0.3}CoCrFeNi$ polycrystalline under tension. Monte Carlo molecular dynamics simulation has been used to identify the effect of different grain boundary types and elemental segregation on deformation twins in CoCrFeNi bicrystals. The results of this research help to further understand the underlying micro and nano-scale phenomena of the improved properties observed in HEAs and to develop metal alloys with even better properties using grain boundary engineering.

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