Study of Dislocation Interactions in Cantor Alloy. Comparison between Molecular Dynamics Modeling and Observation with Transmission Electron Microscope.

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Abstract. Single-phase face-centered cubic Cantor high-entropy alloy CrMnFeCoNi is known for its excellent mechanical properties. These properties are mainly given by the specific arrangement of atoms in this multi-component alloy which affects the creation and movement of dislocations.

Interactions of dislocations with lattice defects in Cantor alloy were investigated. The dislocation structure before and after pressure deformation was observed using transmission electron microscopy and the same level of deformation in a monocrystal and a crystal with subgrains was simulated using molecular dynamics. Both the approaches, numerical simulations, and observation of real structures, revealed that the deformation was carried out only by a slip of dislocations. Mostly the Shockley partials were formed and they often intersected each other, creating dislocation nodes as well as entire networks of dislocation nodes. The interaction probably with the local lattice distortions caused by clusters of atoms occurred. Interactions with subgrain boundaries were also observed. The dislocation movement was slowed down, but some of the dislocations continued to slip in the adjacent subgrain.