IMPACT OF TEMPERATURE AND HYDROGEN ON THE NANOMECHANICAL PROPERTIES OF A HIGHLY DEFORMED HIGH ENTROPY ALLOY

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Due to their quite attractive properties, high-entropy alloys have emerged to an intensely studied class of alloys within the past years. Besides their high strength and maintained ductility, literature reports modest sensitivity to hydrogen embrittlement for conventional microstructures. Utilizing severe plastic deformation methods, for example high-pressure torsion, it is possible to further tailor the mechanical properties by microstructure refinement to the nanometer regime, which in turn increases the hydrogen storage capability at internal defects and boundaries. Furthermore, the nanocrystalline grain size provides markedly enhanced strength values, while the high fraction of grain boundaries influences the hydrogen diffusion and storage kinetics.

Within this study, the micromechanical characteristics of pure Ni and a single phase face-centered cubic CrMnFeCoNi alloy in fine and ultra-fine grained microstructural conditions, fabricated by high pressure torsion, will be investigated in detail. Moreover, electrochemical in-situ nanoindentation will be employed to determine the impact of hydrogen charging on the mechanical performance of this high-entropy alloy class and will be set into context to result found for pure Ni.