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Micromechanical study of precipitation-hardened dual phase high entropy alloy

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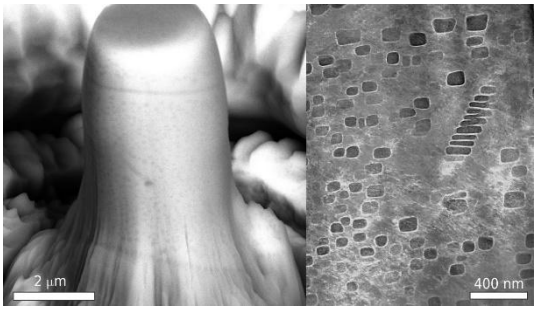
High entropy alloy design has been in the spotlight of materials engineering as the mechanical behaviour can be tuned by the composition, as well as by varying the heat treatment procedure [1]. For this study a *NiCoFeCrGa* alloy was chosen with dual phase (BCC and FCC) structure. The microstructure goes through a spinodal-like decomposition when subjected to slow cooling from high temperature [2]. In order to separate the mechanical behaviour of the constituent phases, micropillars fabricated by focused ion beam (FIB) were deformed using a nanodeformation setup. Two samples having different microstructures (with and without precipitates) were analysed by recording the stress-strain curves of compressed pillars. Selected pillars were lifted out and studied by cross-sectional high (angle) resolution electron backscatter diffraction (HR-EBSD) and high resolution transmission electron microscopy (HR-TEM) to characterize dislocations at the phase- and precipitation boundaries. TEM-based energy dispersive spectroscopy mapping showed that the precipitates are mainly Cr-rich cuboids that globally modify the strength of the alloy [3].



Keywords: high entropy alloys, micromechanics, dislocations, microstructure characterization

Fig.1 (left) backscattered electron image of a compressed BCC pillar, (right) TEM image of the cuboids

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