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PHASE FORMATION IN HIGH-ENTROPY ALLOY THIN FILMS

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Since the beginning of the 21st century, a novel approach to design alloys with promising properties has been introduced [1]. High-Entropy Alloys (HEAs) are composed of five or more principal elements in equimolar ratios. The high mixing entropy can significantly reduce the Gibbs free energy, and thus single-phase multi-component solid solutions are thermodynamically stable, especially at high temperature. In contrast to conventional alloys, the large number of elements does not lead to complex systems but rather simple fcc and/or bcc crystalline structures or amorphous phases are formed. HEAs have excellent properties such as high hardness and strength, corrosion resistance and thermal stability, which makes them suitable for a range of applications. Although bulk HEAs have been studied in depth, the formation and properties of thin film HEAs have not yet been studied in great depth due to the material's complexity.
This work investigates the interplay between different elements and their chemical, topological and thermodynamic properties on the phase formation of HEA thin films. As sputter deposition is a momentum- and energy-driven process, also the deposition conditions influence the film properties [2,3]. The 5-element CoCrCuFeNi alloy was used as a starting point and the influence of three solute elements (Nb, In and Ge) on the film growth and phase formation was studied.

References
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High-entropy alloys
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