

The emergence of ZIA phases

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Abstract (149/150 words)

Investigations on complex physico-metallurgical interactions between refractory elements has been attracting the attention of the materials' community on the challenge to synthesize alloys for applications in high-temperature and irradiation environments since the 1960s. This is the case of Ni-based superalloys and Nb-based refractory alloys which have a wide variety of applications in rockets, nuclear reactors and heat-exchanger components. Such interactions often impair the synthesis of pure terminal solid solutions with these elements due to the formation of complex (sometimes undesired) intermetallic phases. In this work, we focus on these intermetallics and we report the synthesis of the Zig-zag Intermetallics Advanced phases (simply ZIA phases) in the Nb-Ni-Si system. The ZIA phases will be shown to be a distinct class of refractory, highly-concentrated and nanolayered novel materials with a particular zig-zag structure at the atomic scale as opposed to new materials categories such as MAX phases and High-Entropy Alloys.