

γ-brass related complex phases in Rh-Cd binary system

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γ-brasses are a class of Hume-Rothery phases that attract recent attention due to their structurally complex close relation with quasicrystals (QCs) and challenges toward understanding the underlying stabilisation mechanism. A signature characteristic of the γ-phase field in many binary systems is that it accommodates a phase-bundle with exceptional compositional and structural complexities.

The cubic γ-brass phase is stabilised ideally at valence electron concentration (VEC = total number of valence electrons/atoms) = 21/13 (1.615) e/a, and variations of VEC from this ideal value result in structural modifications. γ-brasses are reported between the VEC values of 1.59 and 1.77 e/a.

In the course of this research program, I have been studying the γ-brass field of Rh-Cd binary system to identify all γ-brass related phases and to elucidate their crystal structures. It was previously reported that in analogy to some other related systems, a cubic γ-brass-type phase may exist in the Rh-Cd binary system. Our investigation has uncovered three new γ-brass related phases in the Rh-Cd binary system: γ-Rh₈Cd₄₃, which adopts a rhombohedral variant of a cubic giant cell structure, a monoclinic phase which is identified at approximately 15 atomic % of Rh, and a very complex cubic phase at approximately 11 atomic % of Rh. In this presentation, I will discuss crystal structures and electronic structure of γ-brass related phases in the Rh-Cd binary system.

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