

# Complex Intermetallic Phases in Rh-Cd Binary System

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Complex Intermetallic Alloys (CMA) are of great interest as they are present in all the areas of materials application. They have been broadly utilized due to their electrical, magnetic properties, thermal conductivities, enhanced mechanical properties, good corrosion resistance properties and catalytic properties etc [1].

$\gamma$ -brasses are a special class of complex intermetallic phases that attract attention due to their complex structure and close relation with quasicrystals (QCs) and challenges toward understanding the underlying stabilisation mechanism [2].  $\gamma$ -phase region in many binary systems accommodates a phase-bundle with structural complexities [3]. The ideal  $\gamma$ -brass phase crystallises in cubic space group  $I\bar{4}3m$  (217) with lattice parameter of  $\sim 9 \text{ \AA}$  and is stabilised at valence electron concentration (VEC = total number of valence electrons/atoms) value of 21/13 (1.615) e/a, and a subtle variations of VEC from this ideal value result in structural modifications.

The search for the new Rh-based complex intermetallics has generated much interest because such compounds have been identified as potential heterogeneous catalysts for chemoselective hydrogenation, electrocatalytic oxidation, and selective isomerisation, etc. Cd-rich intermetallic compounds draw huge interest to the structural scientists as they show novel and very complex structures.

In the course of our research program, it was aimed to identify the new phases in the Rh-Cd binary system, as it was mentioned in a previous report that cubic  $\gamma$ -brass-type phase may exist in the Rh-Cd binary system [4].

Our investigations of the Cd rich region of the Rh-Cd system has uncovered existence of at least five new phases[5-7]: (a)  $\text{Rh}_2\text{Cd}_5$  - a line compound at 29 atomic % of Rh, (b)  $\text{Rh}_8\text{Cd}_{43}$  - a rhombohedral phase at 15.7 atomic % of Rh, (c) a monoclinic phase at approximately 15 atomic % of Rh ( $a = 24.554(6) \text{ \AA}$ ,  $b = 14.1551(6) \text{ \AA}$ ,  $c = 20.099(5) \text{ \AA}$   $\beta = 144.46(6)^\circ$ ), (d) a complex cubic phase at ca. 11 atomic % of Rh, and (e)  $\text{Rh}_2\text{Cd}_{15}$  [8]. Among, them, (b-d) correspond to  $\gamma$ -brass related phases in the Rh-Cd binary system. In this presentation, crystal structures of complex phases in the Rh-Cd binary system will be discussed.

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