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New ternary indide $\text{La}_2\text{Pd}_3\text{In}_4$

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Abstract.

A new indide $\text{La}_2\text{Pd}_3\text{In}_4$ was prepared by arc-melting of the elements. X-ray diffraction on single crystals yielded: *Pnma*, *oP36*, $a = 21.8112(6)$ Å, $b = 4.4680(1)$ Å, $c = 8.4145(2)$ Å, $Z = 4$, $R = 0.0355$. $\text{La}_2\text{Pd}_3\text{In}_4$ is a new site exchange variant of the YNi_5Si_3 type. The main geometrical motif is here a set of condensed, palladium-centered trigonal prisms composed of lanthanum and indium atoms. Palladium and indium atoms form a complex three-dimensional $[\text{Pd}_3\text{In}_4]$ polyanion. The lanthanum atoms are located in the two types of distorted hexagonal channels. The compound is diamagnetic and exhibits metallic conductivity.

Key words: rare earth intermetallics, crystal structure, magnetic behavior, electrical properties

1. Introduction

Amidst multitude of various ternary indides $\text{R}_x\text{T}_y\text{X}_z$ (R - rare earth element, T - transition metal, X - indium or other p-element), which have been widely described in the literature [1], only very few La-based systems are known. As examples from the R-Pd-In systems, one can recall here LaPdIn [2], $\text{La}_2\text{Pd}_2\text{In}$ [3], LaPd_2In [4], $\text{La}_4\text{Pd}_{10}\text{In}_{21}$ [5], $\text{La}_8\text{Pd}_{24}\text{In}$ [6], LaPdIn_2 [7], LaPd_3In_2 [8] and LaPd_2In_4 [9], which all crystallize with common structure types. In the course of evaluating the phase equilibria in the R-Pd-In systems, we have recently found a novel ternary compound $\text{La}_2\text{Pd}_3\text{In}_4$, which forms exclusively for $\text{R} = \text{La}$. Here we report on the crystal structure of this material, as well as on its electrical and magnetic properties.

2. Experimental

The new ternary indide $\text{La}_2\text{Pd}_3\text{In}_4$ was synthesized from the pure elemental constituents (lanthanum 99.8%, palladium 99.99% and indium 99.999%) by arc-melting (Mini Arc Melting System, MAM-1).

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