

# New Indides EuAuIn<sub>2</sub>, EuPdIn<sub>4</sub>, GdRhIn<sub>2</sub>, YbRhIn<sub>4</sub>, and YbPdIn<sub>4</sub>

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New intermetallic indium compounds EuAuIn<sub>2</sub>, EuPdIn<sub>4</sub>, GdRhIn<sub>2</sub>, YbRhIn<sub>4</sub>, and YbPdIn<sub>4</sub> were obtained by reaction of the elements. GdRhIn<sub>2</sub> was synthesized in an arc-melting furnace, while EuAuIn<sub>2</sub>, EuPdIn<sub>4</sub>, YbRhIn<sub>4</sub>, and YbPdIn<sub>4</sub> were prepared in sealed tantalum tubes in a high-frequency furnace. The five compounds were investigated by X-ray diffraction both on powders and single crystals. EuAuIn<sub>2</sub> and GdRhIn<sub>2</sub> adopt the MgCuAl<sub>2</sub> type structure with space group *Cmcm*. Single crystal X-ray data yielded  $a = 468.1(2)$ ,  $b = 1105.5(4)$ ,  $c = 753.5(4)$  pm,  $wR2 = 0.096$ , 343  $F^2$  values for EuAuIn<sub>2</sub> and  $a = 435.0(1)$ ,  $b = 1013.3(3)$ ,  $c = 783.6(2)$  pm,  $wR2 = 0.042$ , 608  $F^2$  values for GdRhIn<sub>2</sub> with 16 variables for each refinement. The two structures may be described as gold or rhodium filled versions of the host lattices EuIn<sub>2</sub> and GdIn<sub>2</sub>. The three-dimensional indium networks of EuAuIn<sub>2</sub> and GdRhIn<sub>2</sub> resemble the lonsdaleite structure. Both structures are built up from three-dimensional [AuIn<sub>2</sub>] and [RhIn<sub>2</sub>] polyanions in which the europium and gadolinium atoms occupy distorted hexagonal tubes. The modulations of the In-In distances within the indium networks are compared with other MgCuAl<sub>2</sub> type indides. EuPdIn<sub>4</sub> and YbPdIn<sub>4</sub> crystallize with the YNiAl<sub>4</sub> type, space group *Cmcm*:  $a = 454.8(2)$ ,  $b = 1703.2(8)$ ,  $c = 738.0(3)$  pm,  $wR2 = 0.044$ , 501  $F^2$  values for EuPdIn<sub>4</sub> and  $a = 445.8(2)$ ,  $b = 1666.0(4)$ ,  $c = 747.3(2)$  pm,  $wR2 = 0.050$ , 711  $F^2$  values for YbPdIn<sub>4</sub> with 24 variables for each refinement. In contrast, YbRhIn<sub>4</sub> adopts the LaCoAl<sub>4</sub> type, space group *Pmma*:  $a = 863.7(2)$ ,  $b = 422.5(1)$ ,  $c = 743.1(1)$  pm,  $wR2 = 0.051$ , 467  $F^2$  values and 24 variables. EuPdIn<sub>4</sub>, YbPdIn<sub>4</sub>, and YbRhIn<sub>4</sub> too consist of three-dimensional [PdIn<sub>4</sub>] and [RhIn<sub>4</sub>] polyanions in which the europium and ytterbium atoms are located in distorted hexagonal and pentagonal channels. Common structural motifs of these indides are distorted *bcc*-like indium cubes which are compared with the structures of Y<sub>2</sub>CoIn<sub>8</sub>, YCoIn<sub>5</sub>, EuRh<sub>2</sub>In<sub>8</sub>, and elemental indium. Chemical bonding in these indides is briefly discussed.