

# A Single Crystal Study of $RE_{14}Co_3In_3$ ( $RE = Y, Tb, Dy, Ho, Er$ )

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The rare earth–cobalt–indides  $RE_{14}Co_3In_3$  ( $RE = Y, Tb, Dy, Ho, Er$ ) were prepared in polycrystalline form from the elements by arc-melting. Small single crystals were grown through a special annealing sequence. The compounds were investigated on the basis of X-ray powder and single crystal data:  $Lu_{14}Co_2In_3$  ( $Gd_{14}Co_3In_{2.7}$ ) type,  $P4_2/nmc$ ,  $Z = 4$ ,  $a = 959.0(1)$ ,  $c = 2319.1(5)$  pm,  $wR2 = 0.055$ , 2289  $F^2$  values, 65 variables for  $Y_{13.90}Co_{2.99}In_{3.02}$ ,  $a = 953.8(1)$ ,  $c = 2315.8(5)$  pm,  $wR2 = 0.108$ , 2357  $F^2$  values, 65 variables for  $Tb_{13.92}Co_{3.01}In_{2.92}$ ,  $a = 949.24(3)$ ,  $c = 2296.5(1)$  pm,  $wR2 = 0.129$ , 2518  $F^2$  values, 65 variables for  $Dy_{13.90}Co_{2.97}In_{2.95}$ ,  $a = 946.3(1)$ ,  $c = 2289.0(5)$  pm,  $wR2 = 0.099$ , 2297  $F^2$  values, 64 variables for  $Ho_{14}Co_{2.80}In_{2.89}$ , and  $a = 941.0(1)$ ,  $c = 2274.2(5)$  pm,  $wR2 = 0.140$ , 2450  $F^2$  values, 65 variables for  $Er_{13.83}Co_{2.88}In_{3.10}$ . All  $RE_{14}Co_3In_3$  indides show a small degree of In/Co mixing (between 7 and 16% Co) on the 4c In1 site and defects on the 8g Co1 positions (between 84 and 95% Co). Except for the holmium compound, the  $RE_{14}Co_3In_3$  intermetallics also reveal RE/In mixing on the 4c RE1 sites, leading to the refined compositions. The seven crystallographically independent RE sites have between 9 and 10 nearest RE neighbors. The  $RE_{14}Co_3In_3$  structures consist of a complex intergrowth of rare earth based polyhedra. Both cobalt sites have a distorted trigonal-prismatic rare earth coordination. An interesting feature is the In2–In2 dumb-bell with an In2–In2 distance of 300 pm (for  $Ho_{14}Co_{2.80}In_{2.89}$ ). The crystal chemistry of the  $RE_{14}Co_3In_3$  indides is discussed.

**Key words:** Rare Earth Compounds, Intermetallics, Crystal Chemistry