On the Silicides EuIr$_2$Si$_2$ and Lu$_5$Si$_3$

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EuIr$_2$Si$_2$ was synthesized from the elements in a sealed tantalum tube in a water-cooled sample chamber of an induction furnace. Lu$_5$Si$_3$ was obtained by arc-melting of the elements. Both silicides were investigated by X-ray powder and single crystal diffraction: BaAl$_4$ type, $I4/mmm$, $a = 407.4(1)$ pm, $c = 1010.8(7)$ pm, $wR2 = 0.0492$, 134 $F^2$ values, 9 variables for EuIr$_2$Si$_2$ and Mn$_5$Si$_3$ type, $P6_3/mcm$, $a = 820.0(1)$ pm, $c = 614.2(1)$ pm, $wR2 = 0.0511$, 311 $F^2$ values and 12 variables for Lu$_5$Si$_3$. The iridium and silicon atoms in EuIr$_2$Si$_2$ build up a three-dimensional [Ir$_2$Si$_2$] network with Ir–Si and Si–Si interactions. The europium atoms fill cages within the network. The metal-rich silicide Lu$_5$Si$_3$ contains columns of face-sharing, empty Lu$_6$ octahedra and isolated silicon atoms in a distorted tri-capped trigonal prismatic coordination. Chemical bonding in these silicides is briefly discussed.

Key words: Silicide, Crystal Structure, Solid State Synthesis, Chemical Bonding