High Pressure Synthesis of $EuGa_{2-x}Si_{4+x}$ [x = 1.3(1)]

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The title compound was prepared using a pressure of 8 GPa and a temperature of 1000 °C followed by slow cooling under pressure. After releasing pressure the sample was examined by x-ray powder diffraction, metallographical and EDX analysis. In the sample after the preparation, the compound $EuGa_{2-x}Si_{4+x}$ is found to coexist with $EuGa_{4-x}Si_x$ ($EuGa_4$ type) and Si.

$EuGa_{2-x}Si_{4+x}$ is the second representative of the $EuGa_2Ge_4$ structure type [1] and crystallizes in space group *Cmcm* with a = 4.348(1) Å, b = 10.457(1) Å and c = 11.938(2) Å (V= 542.8 $Å^3$). Gallium and germanium build up a three-dimensional network of four-bonded atoms with europium located in large voids. By replacing germanium with silicon the volume decreases by about 12 %. This change in volume is pronouncedly anisotropic; the length of the a axis increases by 4.6 % whereas the b and c axis shorten by 7.2 % and 9.3 %, respectively.

Due to a partial replacement of gallium by silicon, the electron balance can be written as $Eu^{2+}[Ga(3b)]^{1-}{}_{0.7}[Si(4b)]^{0}{}_{5.3}\cdot 1.3e^-$. Thus, we expect metal-type conductivity. Magnetic susceptibility, electrical resistance and thermoelectric properties of the silicon compound are currently under investigation.

[1] Carrilo-Cabrera W., Paschen S., Grin Yu., *J. Alloys Comp*., 2002, **333**, 4.

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