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**Calcium Substitution in Rare-Earth Metal Germanides with
the Hexagonal Mn_5Si_3 Structure Type. Structural
Characterization of the Extended Series $RE_{5-x}Ca_xGe_3$ ($RE =$
Rare-Earth Metal)**

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Abstract

Reported are the synthesis and the structural characterization of an extended family of rare-earth metal-germanides with a general formula $RE_{5-x}Ca_xGe_3$ ($RE = Y, Ce-Nd, Sm, Gd-Tm$ and $Lu; x < 2$). All twelve phases are isotypic, crystallizing with the Mn_5Si_3 structure type (Pearson index $hP16$, hexagonal space group $P6_3/mcm$); they are the Ca-substituted variants of the corresponding RE_5Ge_3 binaries. Across the series, despite some small variations in the Ca-uptake, the unit cell volumes decrease monotonically, following the lanthanide contraction. Temperature dependent DC magnetization measurements reveal paramagnetic behavior in the high temperature range, and the obtained effective moments are consistent with free-ion RE^{3+} ground state, as expected from prior studies of the binary RE_5Ge_3 phases. The onset of magnetic ordering is observed in the low temperature range, and complex magnetic interactions

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