

# Ternary Stannides $RE_3Ru_4Sn_{13}$ ( $RE = La, Ce, Pr, Nd$ ) – Structure, Magnetic Properties, and $^{119}Sn$ Mössbauer Spectroscopy

Trinath Mishra, Christian Schwickert, Thorsten Langer, and Rainer Pöttgen

Institut für Anorganische und Analytische Chemie, Universität Münster, Corrensstraße 30,  
48149 Münster, Germany

Reprint requests to R. Pöttgen. E-mail: pottgen@uni-muenster.de

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The ternary stannides  $RE_3Ru_4Sn_{13}$  ( $RE = La, Ce, Pr, Nd$ ) were obtained by arc-melting of the elements. The polycrystalline samples were characterized by powder X-ray diffraction. The structures of three compounds were refined from single-crystal diffractometer data:  $Yb_3Rh_4Sn_{13}$  type,  $Pm\bar{3}n$ ,  $a = 977.74(3)$  pm,  $wR2 = 0.0379$ , 280  $F^2$  values for  $La_3Ru_4Sn_{13}$ ,  $a = 971.34(9)$  pm,  $wR2 = 0.0333$ , 274  $F^2$  values for  $Ce_3Ru_4Sn_{13}$ ,  $a = 970.68(8)$  pm,  $wR2 = 0.0262$ , 272  $F^2$  values for  $Nd_3Ru_4Sn_{13}$  with 13 variables per refinement. The structures consist of three-dimensional networks of condensed  $RuSn_{6/2}$  trigonal prisms with the  $RE$  (CN 16) and  $Sn_2$  (CN 12) atoms in two different types of cavities of the networks. The two crystallographically independent tin sites have been resolved by  $^{119}Sn$  Mössbauer spectroscopy. Temperature-dependent magnetic susceptibility measurements of  $Ce_3Ru_4Sn_{13}$  gave a reduced magnetic moment of  $2.32 \mu_B$  per Ce atom, indicating intermediate cerium valence. No magnetic ordering was evident down to 3 K.

*Key words:* Intermetallics, Rare Earth Compounds, Stannide, Crystal Structure