The Stannides *RE*RhSn (*RE* = Ho - Yb) and Sc*T*Sn (*T* = Pd, Pt) – Structure Refinements and ^{119}Sn Mössbauer Spectroscopy

Ratikanta Mishra[a], Rainer Pöttgen[a], Rolf-Dieter Hoffmann[a], Henning Trill[b], Bernd D. Mosel[b], Holger Piotrowski[a], and Markus F. Zumdick[c]

[a] Department Chemie, Ludwig-Maximilians-Universität München, Butenandtstraße 5 - 13 (Haus D), D-81377 München, Germany
[b] Institut für Physikalische Chemie, Universität Münster, Schloßplatz 4/7, D-48149 Münster, Germany
[c] Fraunhofer Institut für Fertigungstechnik und Materialforschung, Winterbergstraße 28, D-01277 Dresden, Germany

Reprint requests to R. Pöttgen. E-mail: rapch@cup.uni-muenchen.de

Dedicated to Professor Dr. H. P. Fritz

Z. Naturforsch. **56 b,** 589–597 (2001); received April 12, 2001

Stannides, Crystal Structure, Mössbauer Spectroscopy

The stannides *RE*RhSn (*RE* = Ho - Yb) and Sc*T*Sn (*T* = Pd, Pt) were prepared by reaction of the elements in sealed tantalum tubes in a high-frequency furnace, by arc-melting, or by a tin-flux technique in quartz tubes. The rhodium based stannides crystallize with the ZrNiAl type structure, space group $P\bar{6}2m$. The four structures were refined from single crystal X-ray data: a = 754.5(3), c = 377.1(1) pm, $wR2$ = 0.0357, 233 F^2 values for HoRhSn, a = 753.3(1), c = 372.16(8) pm, $wR2$ = 0.0721, 233 F^2 values for ErRhSn, a = 753.7(3), c = 369.0(2) pm, $wR2$ = 0.0671, 233 F^2 values for TmRhSn, and a = 753.17(5), c = 366.53(4) pm, $wR2$ = 0.0566, 180 F^2 values for YbRhSn with 14 parameters for each refinement. ScPdSn and ScPtSn adopt the HfRhSn type, a superstructure of ZrNiAl, space group $P\bar{6}2c$: a = 747.5(1), c = 710.2(1) pm, for ScPdSn, and a = 738.37(9), c = 729.47(9) pm, $wR2$ = 0.0452, 369 F^2 values, 18 variables for ScPtSn. Structural motifs in these stannides are transition metal centered trigonal prisms formed by the rare earth and tin atoms. While these prisms are regular in the rhodium based stannides, significant distortions occur in ScPdSn and ScPtSn. The formation of the superstructure can be ascribed to packing reasons. The shortest interatomic distances occur between the transition metal (*T*) and tin atoms. These atoms form three-dimensional [*T*Sn] networks in which the rare earth atoms fill distorted hexagonal channels. The series *RE*RhSn displays a somewhat unique behavior. The a lattice parameter is more or less independent of the rare earth element, while the c lattice parameter shows the expected lanthanoid contraction. ^{119}Sn Mössbauer spectroscopic data of the rhodium stannides show signals at isomer shifts varying from 1.77 to 1.82 mm/s subject to quadrupole splitting between 0.75 to 0.82 mm/s.