Structural and $^{121}$Sb Mössbauer Spectroscopic Investigations of the Antimonide Oxides $\text{RE MnSbO (RE = La, Ce, Pr, Nd, Sm, Gd, Tb)}$ and $\text{RE ZnSbO (RE = La, Ce, Pr)}$

Inga Schellenberg, Tom Nilges, and Rainer Pöttgen

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

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

Z. Naturforsch. 2008, 63b, 834–840; received April 8, 2008

Quaternary antimonide oxides $\text{RE MnSbO (RE = La, Ce, Pr, Nd, Sm, Gd, Tb)}$ and $\text{RE ZnSbO (RE = La, Ce, Pr)}$ were synthesized from the $\text{RE Sb monoantimonides and MnO, respectively ZnO, in sealed tubes at 1170 K. Single crystals were obtained from NaCl/KCl salt fluxes. The ZrCuSiAs-type (space group $P4/nmm$) structures of LaMnSbO ($a = 423.95(7)$, $c = 955.5(27)$ pm, $wR^2 = 0.067$, 247 $F^2$), CeMnSbO ($a = 420.8(1)$, $c = 950.7(1)$ pm, $wR^2 = 0.097$, 250 $F^2$), SmMnSbO ($a = 413.1(1)$, $c = 942.3(1)$ pm, $wR^2 = 0.068$, 330 $F^2$), LaZnSbO ($a = 422.67(6)$, $c = 953.8(2)$ pm, $wR^2 = 0.052$, 259 $F^2$), and NdZnSbO ($a = 415.9(1)$, $c = 945.4(4)$ pm, $wR^2 = 0.109$, 206 $F^2$) were refined from single crystal X-ray diffractometer data. The structures consist of covalently bonded $(\text{RE}^{3+} \text{O}^2^-)^+$ and $(\text{T}^{2+} \text{Sb}^{3-})^-$ layers with weak ionic interlayer interactions. The oxygen and transition metal atoms both have tetrahedral coordination within the layers. $^{121}$Sb Mössbauer spectra of the $\text{RE MnSbO}$ and $\text{RE ZnSbO}$ compounds show single antimony sites with isomer shifts close to $−8 \text{ mm s}^{-1}$, in agreement with the antimonide character of these compounds. PrMnSbO and NdMnSbO show transferred hyperfine fields of 8 T at 4.2 K.

Key words: Antimonides, Oxides, Mössbauer Spectroscopy