

of the rutile phase  $\text{TiO}_{2-x}$ , respectively, using the method of equilibrium between oxides and buffer gaseous mixtures and by means of a high temperature microcalorimeter. These results are discussed in terms of point defects.

*The Iodates of Scandium.* K. NASSAU AND J. W. SHIEVER. Bell Laboratories, Murray Hill, New Jersey 07974. A dihydrate, a monohydrate, and three polymorphs of the anhydride  $\text{Sc}(\text{IO}_3)_3$  have been prepared and studied,  $\text{Sc}(\text{IO}_3)_3 \cdot 2\text{H}_2\text{O}$  was prepared by gel growth and by precipitation and evaporation at room temperature. The  $\gamma$ -anhydride can be crystallized from boiling water or nitric acid solution. The other compounds are formed on heating the dihydrate, which also dehydrates very slowly at room temperature. The  $\alpha$ -anhydride is amorphous. The  $\beta$ -anhydride generates second harmonics, with about twice the efficiency of quartz. In addition, DTA, TGA, infrared absorption, and powder X-ray diffraction results are presented.

*High Resolution Electron Microscopy of Crystallographic Shear Structures in Tungsten Oxides.* S. IJIMA. Department of Physics, Arizona State University, Tempe, Arizona 85281. A crystallographic shear (CS) structure in reduced crystals of  $\text{WO}_3$  has been imaged at a resolution of 3–4 Å by a high resolution electron microscope. A large distortion of the  $\text{WO}_6$  octahedra sharing their edges at the CS planes has been directly recognized in the electronmicrographs. The CS occurs preferentially in a particular crystallographic orientation. The preference may be explained by a different degree of distortion along the principal axes in the  $\text{WO}_6$  octahedra of the pseudocubic structure of  $\text{WO}_3$  crystal. A model for growth and ordering of the CS planes is discussed.

*Etude Structurale de  $\text{Na}_4\text{Sn}_3\text{S}_8$  Evolution de la Coordination de l'Etain dans le Systeme  $\text{Na}_2\text{S}-\text{SnS}_2$ .* J. C. JUMAS, E. PHILIPOTT, AND M. MAURIN. Laboratoire de Chimie Minerale C, ERA 314, Université des Sciences et Techniques du Languedoc, Place Eugene Bataillon, 34060 Montpellier Cedex, France. The crystal structure of  $\text{Na}_4\text{Sn}_3\text{S}_8$  has been determined. This compound crystallizes in the monoclinic system space group  $C2/c$  with the following parameters:  $a = 11.427$ ,  $b = 7.337$ ,  $c = 17.621$  Å,  $\beta = 95.27^\circ$ , and  $z = 4$ . The structure has been solved with the help of a tridimensional Patterson synthesis. The reliability factor after refinement converges to 0.043 for 1620 independent reflexions. The structure contains  $\text{SnS}_4$  tetrahedra and  $\text{SnS}_5$  trigonal bipyramids linked together to form a tridimensional lattice of general formula  $(\text{Sn}_3\text{S}_8)_n$ .

*Energy Transfer in Mercury-Doped Calcium Tungstate and Molybdate.* G. BLASSE. Solid State Department, Physical Laboratory, University of Utrecht, Sorbonnelaan 4, Utrecht, The Netherlands. The luminescence of  $\text{CaWO}_4\text{-Hg}$  and  $\text{CaMoO}_4\text{-Hg}$  is reported. The presence of  $\text{Hg}^{2+}$  ions in the  $\text{CaWO}_4$  lattice influences the luminescence of pure  $\text{CaWO}_4$  drastically due to efficient energy transfer from host lattice groups to the emitting center consisting of a tungstate group with a neighboring mercuric ion. The luminescence characteristics of  $\text{CaMoO}_4\text{-Hg}$  do not differ strongly from those of pure  $\text{CaMoO}_4$  due to the absence of efficient energy transfer.

*Electronic Conductivity in Nonstoichiometric Cerium Dioxide.* R. N. BLUMENTHAL AND R. K. SHARMA. Metallurgy and Materials Science, College of Engineering, Marquette University, Milwaukee, Wisconsin 53233. The electrical conductivity of sintered specimens of nonstoichiometric  $\text{CeO}_{2-x}$  was measured as a function of temperature (750–1500°C) and oxygen pressure ( $1-10^{-22}$  atm). The isothermal compositional dependence of the electrical conductivity of  $\text{CeO}_{2-x}$  was determined by combining recently obtained thermodynamic data,  $x = x(P_{\text{O}_2}, T)$ , with the conductivity data. The compositional and temperature dependence of the electrical conductivity may be represented by the expression

$$\sigma = 410[x]e^{-(0.158+x)/kT}(\text{ohm-cm})^{-1}$$

over the temperature range 750–1500°C and from  $x = 0.001$  to  $x = 0.1$ . This expression was rationalized in terms of the following simple relations for (a) the electron carrier concentration  $n_{\text{CeCe}'} = (8x)/a_0^3$  where  $n_{\text{CeCe}'}$  is the number of  $\text{CeCe}'$  per  $\text{cm}^3$  and  $a_0$  is the lattice parameter and (b) the electron mobility

$$\mu = 5.2(10^{-2})e^{-(0.158+x)/kT}(\text{cm}^2/\text{V sec}).$$