

Ta<sub>2</sub>D<sub>1+x</sub> structure is a nonstoichiometric form of the Ta<sub>2</sub>D superstructure over the range  $x < 0.5$ . The  $\gamma$ -phase is formed below  $-70^\circ\text{C}$  near Ta<sub>4</sub>D<sub>3</sub>, and transforms into the  $\beta_1$ - and  $\delta$ -phases, respectively, in the hypo- and hyperstoichiometric compositions. The  $\delta$ -phase which exists beyond TaD<sub>0.75</sub> changes to the disordered  $\alpha$ -phase around  $100^\circ\text{C}$ .

*The Electrical Conductivity of Single Crystals of Ag<sub>2</sub>HgI<sub>4</sub>.* K. W. BROWALL AND J. S. KASPER. General Electric Research and Development, Schenectady, New York. Electrical conductivity measurements are reported for single crystal samples of Ag<sub>2</sub>HgI<sub>4</sub> in the temperature range between  $-17$  and  $72^\circ\text{C}$ . The results are interpreted in terms of two distinct regions of linear log conductivity vs reciprocal temperature behavior for  $\beta$ -Ag<sub>2</sub>HgI<sub>4</sub>, a phase transition region, and an  $\alpha$ -Ag<sub>2</sub>HgI<sub>4</sub> region. The data reaffirm the anomalously high preexponential and activation energy terms in the conductivity equation for  $\alpha$ -Ag<sub>2</sub>HgI<sub>4</sub> as compared with other AgI-type conductors. Thermo-emf measurements on polycrystalline Ag<sub>2</sub>HgI<sub>4</sub> samples are also reported.

*The Effect of Crystal Size on Chemical Hysteresis in Praseodymium and Terbium Oxides.* A. T. LOWE, K. H. LAU, AND L. EYRING. Department of Chemistry, Arizona State University, Tempe, Arizona 85281. The effect of the variation of crystal size on chemical hysteresis in phase reactions has been investigated by means of thermogravimetric analysis. Series of isobars were followed at several different pressures and crystal sizes for the PrO<sub>x</sub>-O<sub>2</sub> and TbO<sub>x</sub>-O<sub>2</sub> systems. At higher temperatures, the extent of hysteresis decreased with increase in crystal size for both oxides. It was found that equilibrium was not attained in reactions occurring at lower temperatures. These experiments are contrasted with previous investigations using powdered samples. Some plausible explanations for the trends observed are discussed.

*Mischkristallbildung und Kationenordnung im System Bleihydroxylapatit-Calciumhydroxylapatit.* G. ENGEL, F. KRIEG, AND G. REIF. Fachhochschule Aalen, Fachbereich Chemie, 7080 Aalen, Postfach 1728, Germany. In the system Pb<sub>10</sub>(PO<sub>4</sub>)<sub>6</sub>(OH)<sub>2</sub>-Ca<sub>10</sub>(PO<sub>4</sub>)<sub>6</sub>(OH)<sub>2</sub> there exists a complete series of solid solutions. Outstanding deviation from Vegard's law and a break in the dependence of the  $c$ -constants are to be found at the composition Pb<sub>6</sub><sup>II</sup>Ca<sub>4</sub>(PO<sub>4</sub>)<sub>6</sub>(OH)<sub>2</sub>. Together with calculations of X-ray intensities they reveal the indicated ordering of Pb on the M<sup>II</sup>(=6h)- and of Ca on the M<sup>I</sup>(=4f)-positions of the apatite structure. The above 6:4 compound constitutes an analogy to nasonite and ganomalite. These minerals have structures related to the apatite type. The reason for the Pb<sup>2+</sup> ordering is its tendency to form bonds with partially covalent character. The same cation is observed in two other apatite solid solutions, (Pb, Ca<sub>10</sub>)(PO<sub>4</sub>)<sub>4</sub>-(SiO<sub>4</sub>)<sub>2</sub> and (Pb, Ca)<sub>8</sub>Na<sub>2</sub>(PO<sub>4</sub>)<sub>6</sub>, respectively. Starting from Ca<sub>10</sub>(PO<sub>4</sub>)<sub>6</sub>(OH)<sub>2</sub> there is a drastic reduction of thermal stability with Pb substitution. It leads to a minimum which approximates to the composition Ca<sub>8</sub>Pb<sub>2</sub>(PO<sub>4</sub>)<sub>6</sub>(OH)<sub>2</sub>. The reason is the strong increase in the degree of dehydration to oxyapatite, and the subsequent decay of the apatite structure. On precipitation (Pb, Ca)-hydroxy apatites from aqueous solutions there is a strong enrichment of Pb in the solid. Under the conditions mentioned in the text the initial enrichment of Pb is appreciably reduced in the course of several hours. The distribution coefficient for these conditions approximates to  $D = 25$ .

*A Microdomain Description of Defective Fluorite-Type Phases Ca<sub>x</sub>M<sub>1-x</sub>O<sub>2-x</sub> (M = Zr, Hf, x = 0.1-0.2).* J. G. ALLPRESS AND H. J. ROSSELL. CSIRO Division of Tribophysics, University of Melbourne, Parkville, Victoria, 3052, Australia. Electron diffraction patterns from cubic solid solutions of lime in zirconia and hafnia contain weak diffuse features in addition to the strong reflexions expected from the fluorite structure type. A comparison of these features with those found in patterns from annealed specimens suggests that the solid solutions contain domains embedded coherently in a number of specific orientations within the cubic matrix. Each domain is about  $30 \text{ \AA}$  in diameter, and its structure corresponds to that of CaHf<sub>4</sub>O<sub>9</sub>. Calculations based on this model agree with the observed diffraction data.

*Growth and Optical Properties of TiGaSe<sub>2</sub> and  $\beta$ -TlInS<sub>2</sub>.* T. J. ISAACS AND J. D. FEICHTNER. Westinghouse Research Laboratories, Pittsburgh, Pennsylvania 15235. TiGaSe<sub>2</sub> and  $\beta$ -TlInS<sub>2</sub> were studied for crystal growth and optical properties. Both materials have wide transparency regions, from  $0.61$  to  $20 \mu\text{m}$  for the former and  $0.5$ - $12.5 \mu\text{m}$  for the latter. X-ray studies of single crystals show that these compounds are monoclinic, space group  $P2_1/m$ . Raman spectra are presented.