

The series of compounds $RTiO_3$, $R = Gd, Tb, Dy, Ho, Er,$ and Tm , were obtained as single-phase materials via solid state reaction between Ti_2O_3 and R_2O_3 at ca. $1500^\circ C$ in welded molybdenum crucibles under argon. $YbTiO_3$ and $LuTiO_3$ could not be obtained as single-phase materials using this procedure. Lattice constants for all compounds were determined from powder X-ray data and are compared with previous results. All of these materials order magnetically between 30 and $70^\circ K$. From the appearance of the χ_m^{-1} vs T curve the type of order can be identified as ferrimagnetic. High-temperature susceptibility data have been fitted to a two-sublattice molecular field model and the intra- and intersublattice interaction constants have been extracted. It is found that the Ti-Ti interaction is ferromagnetic and relatively constant from $R = Gd$ to $R = Lu$. Low-temperature magnetization-field data suggest the existence of complex magnetic structures or large magnetocrystalline anisotropy or both. The magnetic properties of the $RTiO_3$ series are compared to those of the chemically similar and better-known RMO_3 phases where $M = Al, V, Cr, Mn,$ and Fe . The observed differences are shown to follow from the sign of the M - M interaction, which is ferromagnetic for $M = Ti$ and antiferromagnetic for $M = V, Cr, Mn,$ and Fe , together with the implications of the crystal symmetry for the R - M interaction.

Thermodynamics of Hydrogen Trapping in Intermetallic Compounds: Application to $LaNi_5/H$. TED B. FLANAGAN, C. A. WULFF, AND B. S. BOWERMAN. Department of Chemistry, University of Vermont, Burlington, Vermont 05405.

It has been observed for several intermetallic compound/H systems that deviations from Sieverts' law of ideal solubility occur which are in the opposite direction from the deviations from ideality which occur in pure metal/H systems. The principal source of nonideality in both types of interstitial solutions arises from the changes of the relative partial molar enthalpy of H_2 solution, ΔH_H , with H content. The variations of ΔH_H with H content are, however, in the opposite directions for intermetallic- and pure metal/H interstitial solutions. Relative partial molar entropies for solution of H_2 in the α -phase of the $LaNi_5/H$ system are given at $298.2^\circ K$. These have been determined from calorimetric determinations of ΔH_H and measurements of $\Delta G_H (= RT \ln p_{H_2}^{1/2})$. The partial entropies show unusual extrema as a function of H content. A model based on trapping of H atoms is proposed which explains the variations of ΔH_H and ΔS_H . Since the deviations from ideality arising from an increase of ΔH_H with H content seem to be limited to solids with at least two different ordered metal components, e.g., intermetallic compounds, it seems reasonable to assign the trapping sites to interstices which result from an interchange of metal atoms. This interchange may create interstices rich in those nearest-neighbor metal atoms which have the greatest affinity for H.

Lead Phosphate Apatites Substituted by Rare Earth, Sodium, and Potassium Ions. I. MAYER, A. SEMADJA, AND V. WEISS. Department of Inorganic and Analytical Chemistry, Hebrew University, Jerusalem, Israel.

Rare-earth-substituted lead apatites of the $Pb_{10-2x}Ln_xM_x(PO_4)_6Y_2$ ($Ln = La, Nd, Eu, Gd, Dy,$ and Y ; $M = Na$ and K ; $Y = F$ and Cl) systems were prepared and studied by X-ray diffraction and infrared methods. The powder patterns of all the compounds show the apatite-like hexagonal structure. Single-crystal precession data reveal that the space group of the $Pb_6Ln_2(PO_4)_6F_2$ compounds is probably $P\bar{6}$ while that of $Pb_6Ln_2K_2(PO_4)_6F_2$ is $P6_3/m$. Analysis of the spectra of substituted Ca, Ba, and Pb compounds shows the effect of substituted ions on the spectra and supports the assumption that substitution in the Ba and Pb systems is an ordered process. Ordering of the substituted ions in the systems studied is discussed in view of changes in lattice parameters, size conditions, and polarizing properties of the ions.

Neutron Diffraction Study on the Mechanism of the Topotactic Reduction of $2H-TaS_2$ Electrodes. C. RIEKEL, H. G. REZNIK, AND R. SCHÖLLHORN. Anorganisch-chemisches Institut der Universität, Gievenbecker Weg 9, 4400 Münster, West Germany.

The dynamic investigation by neutron diffraction of the topotactic reduction of $2H-TaS_2$ electrodes in K^+/D_2O electrolyte to the ionic layered hydrate $K_{0.5}^+(D_2O)_{0.5}[TaS_2]^{0.5-}$ is shown to proceed via third-stage $K_x^+(D_2O)_y[TaS_2]_3^{x-}$, second-stage $K_x^+(D_2O)_y[TaS_2]_2^{x-}$, and first-stage $K_x^+(D_2O)_y[TaS_2]^{x-}$ intermediates. A comparative study by X-ray diffraction on the cathodic intercalation of $2H-TaS_2$ and