

phase limits are from $\text{Sn}_{0.04}\text{WO}_3$ to $\text{Sn}_{0.06}\text{WO}_3$. Two orthorhombic II bronze phases form, one at a composition of $\text{Sn}_{0.13}\text{WO}_3$ to $\text{Sn}_{0.15}\text{WO}_3$, and another at $\text{Sn}_{0.16}\text{WO}_3$. These bronzes have structures which consist of lamellae of WO_3 united by fault planes. The other bronze phase to form, with the tetragonal tungsten bronze structure, has a lower composition limit of $\text{Sn}_{0.21}\text{WO}_3$.

Thermodynamics of Double Oxides. II. Study of the CoO-TiO₂ System by the Electromotive Force Method. S. G. POPOV AND V. A. LEVITSKII, Laboratory of Chemical Thermodynamics, Moscow State University, Moscow, 117234, USSR. The emf method using an oxide-ion-conducting electrolyte has been used to determine the thermodynamic properties of CoO-TiO₂ system in the temperature range 1160–1420°C. Electrochemical reduction and oxidation of the electrodes showed that the compositional boundary for $\text{CoTiO}_{3-\gamma}$ is near the composition $\text{CoTiO}_{2.85}$. Standard values of ΔH° and ΔG° of formation of CoTiO_3 and Co_2TiO_4 from oxides and elements, as well as entropies for these compounds, are presented and compared with the literature data. The discrepancy in ΔH° values of formation from oxides for some spinels obtained from emf and gas equilibrium data and by high-temperature solution calorimetry is discussed.

Growth of Single-Phase, Single Crystals of V₉O₁₇. H. KUWAMOTO, N. OTSUKA, AND H. SATO, School of Materials Engineering, Purdue University, West Lafayette, Indiana 47907. Single crystals of Magnéli phase V_9O_{17} were successfully grown for the first time by a vapor transport technique utilizing TeCl_4 as a transport agent. No trace of syntactically intergrown V_3O_{15} could be detected in these crystals. The structure is triclinic and is homologous to other Magnéli phase compounds $\text{V}_n\text{O}_{2n-1}$ ($n = 3-8$). The lattice parameters (of the reduced cell) measured are $a = 7.009 \text{ \AA}$, $b = 14.518 \text{ \AA}$, $c = 5.418 \text{ \AA}$, $\alpha = 95.5^\circ$, $\beta = 108.9^\circ$, $\gamma = 83.1^\circ$. This compound manifests a metal-insulator transition as in other Magnéli phase compounds. The transition temperature has been determined to be 79 K. At or below the transition point down to 16 K, at which an anomalous peak in the resistivity exists, a time dependence of resistivity at fixed temperatures is found. The existence of $\text{V}_{10}\text{O}_{19}$ was also confirmed by transmission electron microscopy in a material produced under highly nonequilibrium conditions, intergrown in the matrix of V_9O_{17} in a microsyntactic fashion. The existence of $\text{V}_{10}\text{O}_{19}$ has never been reported.

The Structure of LaTaO₄ at 300°C by Neutron Powder Profile Analysis. R. J. CAVA AND R. S. ROTH, Bell Laboratories, 600 Mountain Avenue, Murray Hill, New Jersey 07974. LaTaO_4 above 175°C is orthorhombic, space group $A2_1am$, with $a = 5.6643(1)$, $b = 14.6411(3)$, $c = 3.9457(1)$, and $z = 4$. It is isostructural with room temperature BaMnF_4 . The structure, refined by the Rietveld powder profile analysis technique to a final agreement index of 8.6%, consists of sheets of corner-shared TaO_6 octahedra extending perpendicular to b , bonded to each other parallel to b by the 9-coordinated lanthanum ions. All atoms are in position $(x, y, 0)$ with coordinates: La(.1788, .1676), Ta(.2192, .4141), O1(.4216, .3008), O2(-.0486, .3380), O3(.5614, .4689), O4(.2496, .9153). Orthorhombic CeTaO_4 and PrTaO_4 are isostructural.

The Crystal of Lu₃S₄: A New Population Wave Structure. A. V. HARIHARAN, D. R. POWELL, R. A. JACOBSON, AND H. F. FRANZEN, Ames Laboratory-DOE and Department of Chemistry, Iowa State University, Ames, Iowa 50011. The monosulfide of lutetium loses lutetium preferentially upon vaporization *in vacuo* at 1750°C, and the quenched samples exhibit a new structure which is formed by an ordering of metal vacancies on the rock-salt type of lattice.

Structure cristalline de K₂SO₄(SbF₃)₂. MARIE BOURGAULT, BERNARD DUCOURANT, BERNARD BONNET, AND ROBERT FOURCADE, Laboratoire de Chimie Minérale D, Université des Sciences et Techniques du Languedoc, Place Eugène Bataillon, 34060 Montpellier Cédex, France. The crystal structure of $\text{K}_2\text{SO}_4(\text{SbF}_3)_2$ was determined by X-ray diffraction on a single crystal ($R = 0.035$ for 2264 reflections). There are two families of antimony atoms showing two different environments: AX_5E octahedron (6-coordination) and AX_6E 3.3.1 monocapped octahedron (7-coordination). The SO_4^{2-} unit weakly bonded to four antimony atoms is not much distorted. This arrangement permits the minimization of π -E interactions. Infrared and Raman spectra are discussed in terms of diffraction results.

The Crystal Structure of Mg₅₁Zn₂₀. IWAMI HIGASHI, NOBUHIRO SHIOTANI, M. UDA, TADASHI MIZOGUCHI, AND HIROAKI KATOH, The Institute of Physical and Chemical Research, Wako-Shi,

Saitama, 351 Japan. The crystal structure of $Mg_{51}Zn_{20}$, a phase designated conventionally as " Mg_7Zn_3 ," has been determined by the single-crystal X-ray diffraction method. It was solved by the examination of a Patterson synthesis, and refined by the ordinary Fourier and least-squares method; the R value obtained was 4.8% for 1167 observed reflections. The crystal is orthorhombic, space group $Immm$, with $a = 14.083(3)$, $b = 14.486(3)$, $c = 14.025(3)$ Å, and $Z = 2$. There are 18 independent atomic sites, Zn1–Zn6, Mg1–Mg10, A, and B, and the last two sites are statistically occupied by Zn and Mg atoms with the occupancies $0.46(2)Zn7 + 0.52(2)Mg11$ and $0.24(2)Zn8 + 0.74(2)Mg12$ for A and B, respectively. The structure of the crystal is described as an arrangement of icosahedral coordination polyhedra, to which all but the Zn3 site belong. In this arrangement the Zn atoms other than the Zn3 and Zn8(B) center the icosahedral coordination polyhedra with coordination number 12. The Zn3, Zn8 atoms and all the Mg atoms except Mg11(A) are located at the centers of various coordination polyhedra with the coordination numbers from 11 to 15. The distances between neighboring atoms are 2.71–3.07, 2.82–3.65, and 2.60–3.20 Å for Zn–Zn, Mg–Mg, and Zn–Mg, respectively.

Studies of Layered Uranium (VI) Compounds. VI. Ionic Conductivities and Thermal Stabilities of $MUO_2PO_4 \cdot nH_2O$, where $M = H, Li, Na, K, NH_4$ or $\frac{1}{2}Ca$, and where n is between 0 and 4. CHRISTOPHER M. JOHNSON, MARK G. SHILTON, AND ARTHUR T. HOWE, Department of Inorganic and Structural Chemistry, University of Leeds, Leeds LS2 9JT, England. We have measured the ionic conductivities of pressed pellets of the layer compounds $MUO_2PO_4 \cdot nH_2O$, and correlated the results with TGA data. The conductivities (in $ohm^{-1} m^{-1}$), at temperatures increasing with decreasing water content over the range 20 to 200°C, were approximately as follows: Li^+-4H_2O , 10^{-4} ; Li^+ , Na^+ , K^+ , and $NH_4^+-3H_2O$, 10^{-4} , 10^{-2} , 10^{-4} , and 10^{-4} ; H^+ , Li^+ , and $Na^+-1.5H_2O$, 10^{-2} , 10^{-4} , and 10^{-4} ; Na^+-1H_2O , 10^{-5} ; H^+ , K^+ , and $NH_4^+-0.5H_2O$, all 10^{-5} ; and H^+ , Li^+ , Na^+ , K^+ , NH_4^+ , and $\frac{1}{2}Ca^{2+}-0H_2O$, 10^{-5} , 10^{-5} , 10^{-4} , 10^{-5} , 10^{-6} , and 10^{-6} . A ring mechanism is proposed to account for the high conductivity found in $NaUO_2PO_4 \cdot 3.1H_2O$. The accurate TGA data showed that most of the hydrates had water vacancies of the Schottky type, and should be represented as $MUO_2PO_4(A - x)H_2O$, where x can be between 0 and 0.3.

Le systeme $Ba_2Fe_2O_5-BaZnO_2$. Mise en évidence de 3 nouvelles phases. PATRICK NEU, MICHEL ZANNE, AND CHARLES GLEITZER, Laboratoire de Chimie de Solide Minérale, Service de Chimie Minérale, Université de Nancy I, C.O. 140, 54037 Nancy Cedex, France. In order to obtain phases with a high deficiency of oxygen, iron is progressively substituted by zinc in $Ba_2Fe_2O_5$ at 900–1000°C. For $0.05 < x < 0.40$ ($x = Zn/Fe + Zn$), the long-range order between tetrahedra and octahedra of the brownmillerite is destroyed and the cell is perovskite type with up to 23% oxygen vacancies. For $x = 0.5$ there is a new superlattice and an orthorhombic compound $Ba_4Fe_2Zn_2O_9$. For $0.7 < x < 0.9$ a new cubic phase is formed which is related to $BaZnO_2$.