expected to exist in subsequent products. (b) The metals occupy fcc positions, and their rearrangement in subsequent phases at room temperature is unlikely. The observed H_2/Pu ratios at which slope changes occur are in excellent agreement with the theoretical values for the following sequence of products: Pu(O)H (0.500), $Pu_7O_9H_3$ (1.071), Pu_2O_3 (1.500), Pu_7O_{12} (1.714), Pu_9O_{16} (1.778), $Pu_{10}O_{18}$ (1.800) $Pu_{12}O_{22}$ (1.833) and PuO_2 (2.000). All these phases are expected to have metal atoms on fcc positions with the anion positions of fluorite occupied at Pu(O)H and PuO_2. During hydrolysis of the oxide hydride phases, the metal presumably remains trivalent while ordered defects are created on anion sites until the formation of C-type Pu_2O_3 is complete. As hydrolysis continues, ordered occupancy of anion sites occurs as Pu(III) is converted to Pu(IV). The mixed-valent oxides proposed for Pu are identical to those of Pr. $Pu_7O_9H_3$ is considered to be an analog of Pu_7O_{12}. Our results suggest that six previously unknown phases exist in Pu + O + H.

Although our characterization of the product formed by thermal decomposition of Pu(O)H in dynamic vacuum at 100–200 °C is incomplete, all observations suggest that it is metastable plutonium monoxide, PuO.

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1 J. M. Cleveland, 'The Chemistry of Plutonium', Gordon and Breach, New York (1970).
2 J. T. Waber, 'Plutonium Handbook', vol. *1*, 6, 149.
3 A. E. Hodges, III and J. M. Haschke, USDOE Rept. RFP-2919 (1979).
4 L. Eyring, 'Handbook on Physics and Chemistry of Rare Earths', Vol. 3, 27 (1979).

D18

Oxygen Nonstoichiometry in Calcium and Strontium Uranates ($CaUO_{4-x}$ and $SrUO_{4-x}$): Lattice Parameters and Enthalpies of Formation[+]

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Nonstoichiometric calcium monouranate, $CaUO_{3.50}$, was prepared by reducing $CaUO_4$ in a hydrogen stream at 900 °C. $CaUO_{3.64}$ and $CaUO_{3.81}$ were prepared by heating mixtures of $CaUO_{3.50}$ and $CaUO_4$ in evacuated quartz tubes at 900 °C for 50 h. Nonstoichiometric strontium monouranates with compositions $SrUO_{3.62}$, $SrUO_{3.70}$, and $SrUO_{3.87}$ were prepared by heating mixtures of $SrUO_{3.52}$ and α-$SrUO_4$ in evacuated tubes at 300 °C for 100 h. Chemical analyses were carried out for the products. These are all rhombohedral (R$\bar{3}$m). The lattice c-parameter decreases at a much larger rate than the a-parameter with increasing oxygen amount, but there exist two-phase regions at $CaUO_{3.81}$ and $SrUO_{3.87}$.

The effect of heating conditions for these phases was examined. The enthalpies of formation of these compositions were measured. The variation of these data as a function of nonstoichiometry is discussed.

D19

Magnetic Properties of the Rhomboedral Ferrites $LuFe_2O_4$ and $LuMgFeO_4$

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D20

Two New Families of Lanthanoide Ferrites $Ln_2Fe_4O_9$ and $Ln_4Fe_6O_{15}$

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D21

Synthesis, Structural Study and Electrical Properties of Hydride–Oxides: LaHO, $LaH_{1+2x}O_{1-x}$ and $LaH_{1+y}O_{1-x}$ (y = 2x)

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