conversion was incomplete. In two runs, one at 580° and one at 925° the monoclinic form was used as the starting material. No conversion of this oxide was observed.

X-ray diffraction analysis of the products of the high pressure runs revealed, in addition to the two oxides, various hydroxides and oxyhydroxides. The water for the formation of these compounds comes from the decomposition at elevated temperature of the pyrophyllite gasket material. We have observed both of the previously reported hydroxides and the previously reported oxyhydroxide SmOOH. In addition, we have found a new phase which we call β-SmOOH.

Weight loss versus temperature curves from preparations showing only the x-ray diffraction lines of the new phase were obtained. These are shown in Figure 4. In each case the sample was heated in air for one hour at the indicated temperature, cooled, weighed and reheated to the next higher temperature. The weight loss begins above 300°C and constant weight is observed above 700°C. In one case a small aliquot was taken for x-ray diffraction analysis after heating to 500°C. The curve shows this as a weight loss. The curve has not been renormalized for this loss since the displacement of the curve is small. Shown in the same figure is Sm_2O_3-H_2O. In a separate experiment a sample was heated in vacuum to 700°C. The evolved gases were condensible at the temperature of liquid nitrogen and the weight loss was comparable to that reported above. Therefore, it is assumed that the new phase has the composition SmOOH.

Infrared measurements were made with a Perkin Elmer Model 221 spectrometer. The sample was scanned in the wavelength range from 2.5 to 16 microns using both KBr pellet and petrolatum mull techniques. The OH stretching vibration at 2.93 micron was observed together with the bending vibration at 6.8 microns. In addition, unassigned absorption peaks between 11 and 15 microns were observed.