

Beta-SmOOH is light yellow in color. Since no single crystals could be isolated, optical properties could not be determined. It was, however, determined to be optically anisotropic with an average index of refraction of approximately 1.93.

The x-ray diffraction results are shown in Figure 5. These have been indexed on a tetragonal unit cell with $a_0 = 8.07$, $c_0 = 11.2$. The observed density, 6.62 grams per cc, gives 15.9 formula weights per unit cell. This is reasonable for a tetragonal structure. We assume therefore 16 formula units per unit cell and a theoretical density of 6.66. As indicated above no single crystals could be isolated and no more detailed studies could be performed.

However, it should be noted that by a 45° rotation around the C-axis, a nearly cubic cell can be obtained with sides averaging about 11.3 Å which contains 32 formula units, that is $H_{32}Sm_{32}O_{64}$. This cube is only slightly larger than that of the defect fluorite lattice of cubic Sm_2O_3 and contains just enough excess oxygen ions to fill the vacancies in that structure. In fact a fair fit of the stronger lines to a cube with $a_0 \sim 5.70$ expedited the determination of the tetragonal unit cell given above. It is reasonable then to postulate a structure based on the fluorite structure and to ascribe the shortening of the C-axis, relative to the A-axis to hydrogen bonding.

Beta-SmOOH is easily converted to the hydroxide by boiling in water for fifteen minutes. After air drying at $110^\circ C$, the weight loss on ignition to $1100^\circ C$ is 12.6%, corresponding to the loss of 1.49 moles of H_2O per mole of starting SmOOH. X-ray diffraction examination of this hydroxide gave the results shown in Figure 6. These d-values have not been indexed and do not correspond to either of the two reported hydroxides as shown in the same table. Note that