

TABLE VI  
COMPARISON OF X-ray RESULTS  $\text{Sm}(\text{OH})_3$

$\text{Sm}(\text{OH})_3$ This Work		$\text{Sm}(\text{OH})_3$ Hexagonal			$\text{Sm}(\text{OH})_3$ High-Pressure Form	
<u>d</u>	<u>I/I</u>	<u>d</u>	<u>I/I</u>	<u>hkl</u>	<u>d</u>	<u>I/I</u>
5.609	80	5.54	100	(100)	7.816	25
3.296	5	3.16	70	(110)	5.566	35
3.251	60	3.03	55	(101)	3.723	80
3.084	100	2.734	15	(200)	3.363	5
2.780	20	2.183	90	(201)	3.089	40
2.423	8	2.064	15	(210)	2.852	5
2.222	70	1.821	50	(300)	2.768	25
2.099	15	1.795	65	(211)	2.583	100
1.848	35	1.575	15	(220)	2.089	30
1.824	55	1.519	7	(310)	2.057	5
1.751	8	1.400	20	(311)	1.843	45
1.599	25	1.366	10	(400)	1.819	5
1.537	6	1.284	10	(401)	1.596	15
1.415	13	1.194	10	(410)	1.592	10
1.384	6				1.548	20
1.307	8				1.534	10
					1.382	5
					1.290	10
					1.206	10
					1.204	5

## 2. Experimental

### a. Starting Materials

1) MgO -- Except as otherwise noted, all the MgO employed was Fisher electronics grade with an average particle size of 300A as determined by X-ray diffraction line broadening or 500A as determined by electron microscopy. Before use, the material was preheated to 600° C in air atmosphere to decompose any brucite present and drive off any volatiles.

2) NiO -- Nickel oxide was prepared by the calcination at 1000° C for 24 hours of NiSO<sub>4</sub>·6H<sub>2</sub>O obtained from Allied Chemical. After calcination the average particle size was 2000 A as determined by electron microscopy examination

3) Cr<sub>2</sub>O<sub>3</sub> -- Chromium oxide was prepared by calcination at 1000° C of chromium ammonium sulfate. After calcination, the average particle size was 3800A as determined by electron microscopy examination.

4) Al<sub>2</sub>O<sub>3</sub> -- The aluminum used was Linde B, a mixture of  $\gamma$  alumina, with a grain size of 0.02 micron, and  $\alpha$ -alumina with a grain size of 0.20 micron. These grain sizes were determined by electron microscopy.

### b. Sample Preparation

The  $1 \times 10^6$  psi apparatus with a 0.750-inch internal diameter provides for a sample diameter of 0.500 inch and a length of approximately 1 inch.

The starting material was formed into cylinders and isostatically prepressed to approximately 50 percent of theoretical density. After this prepressing, the sample was machined to the size indicated above, inserted into the heater casing and assembled with the pyrophyllite gaskets in the apparatus. When thermocouples were to be used, they were installed as described previously.

## 3. Results

### a. MgO

The fabrication runs made in this program are summarized in Appendix C. Samples from runs 20 and 21 for example, were submitted to metallographic and electron microscopy determination of hardness, grain size and density. Both had been pressed at 250,000 psi at