

Investigations of the stability limits of the various structural modifications have been carried out for a number of years. The range of stability of the three modifications as a function of cation-radius and temperature as proposed by Shafer and Roy is shown in Figure 3. It is evident from this figure that samarium oxide lies near the border between the A - and B - type fields at high temperature. However, the A-type oxide of samarium has not been observed either in high-temperature x-ray studies nor in room-temperature examination of material quenched from high temperatures.

In the hexagonal oxide each cation has seven nearest oxygen neighbors compared with six such neighbors in the other structures. This results in a greater density in the hexagonal modification compared with the other two forms. Thus, in the case of neodymium oxide, the relative volumes are A:B:C = 75.5:77.7:84.6 ($\text{\AA}^3/\text{FW}$). It seemed that if the A-modification of Sm_2O_3 could be formed that both high temperature and high pressure would be required. Accordingly, we have examined material quenched from high temperature at pressures to 30 kilobars. In no case was any trace of an hexagonal modification observed.

Experimentally, C-form (cubic) oxide ($d = 10.89 \text{ \AA}$) obtained from Research Chemicals Corporation was prepressed in a steel die to approximately 50% of theoretical density. This compact was loaded into a nickel tube and into the high pressure apparatus described previously. Some samples were instrumented with thermocouples, others were not. In the absence of such instrumentation the temperature of the run was estimated from the power settings as calibrated in the instrumented runs.

In eight runs at 30 kilobars and temperatures between 575°C and 925°C the C-form was converted to the more dense B-form. At the lowest temperature the