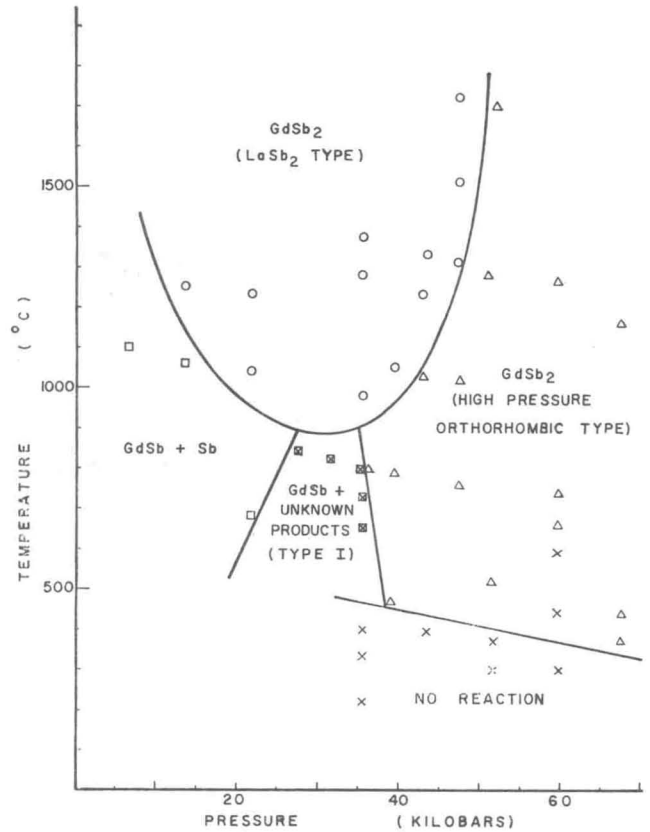

Figure 2.—Gd–2Sb reaction product diagram.

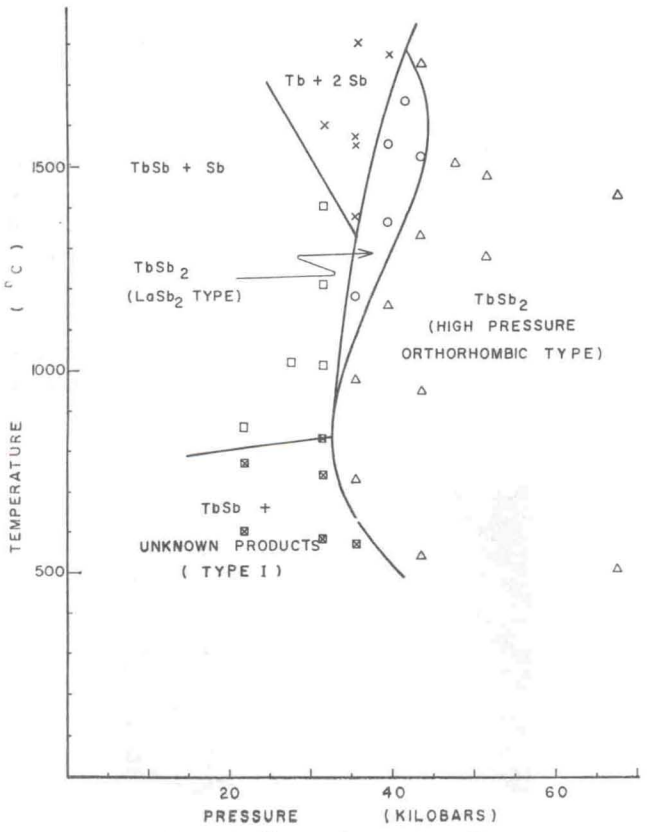

Figure 3.—Tb–2Sb reaction product diagram.

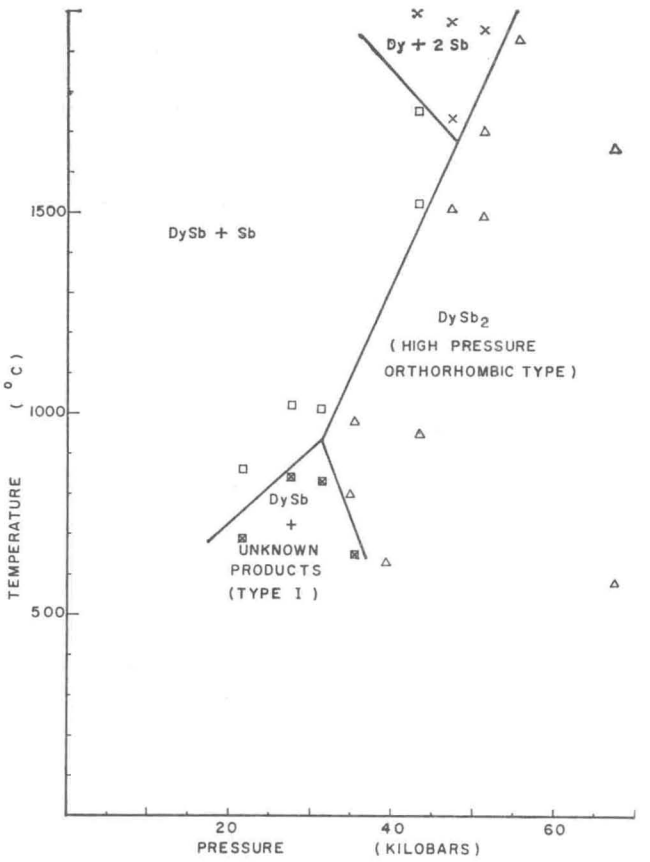

Figure 4.—Dy–2Sb reaction product diagram.

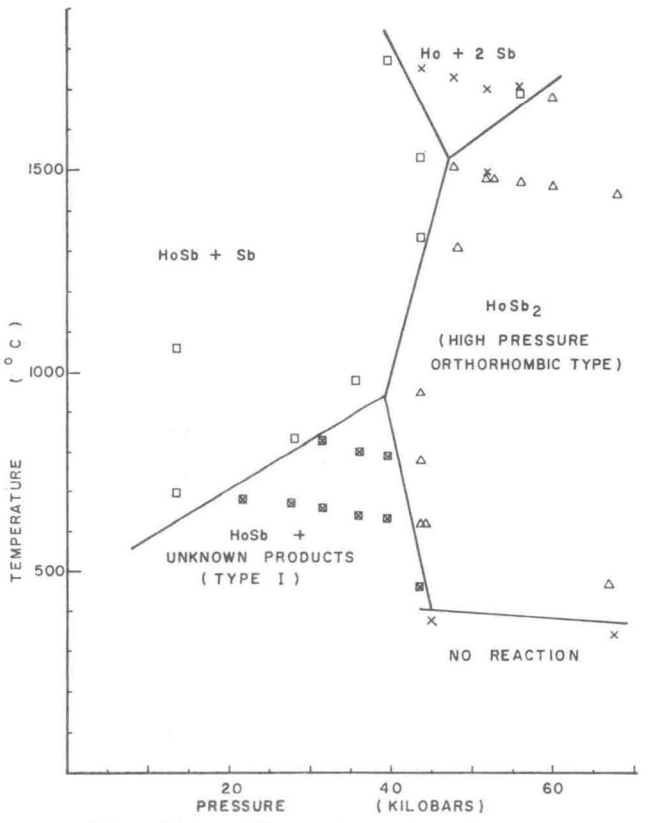

Figure 5.—Ho–2Sb reaction product diagram.

peratures below 900° and pressures between 25 and 35 kbars a mixture of GdSb and unidentified products was obtained. The cubic lines of GdSb could easily be picked out of the X-ray diffraction pattern but there were several additional weak lines which were not identified. They gave no recognizable pattern. This phase was called "unknown product, type I." At pressures above 40–50 kbars and temperatures high enough to ob-

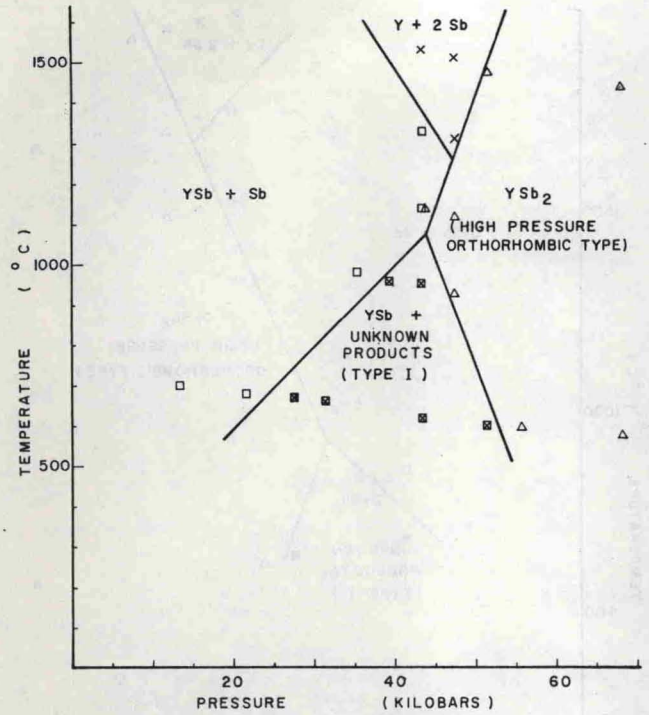

Figure 6.—Y–2Sb reaction product diagram.

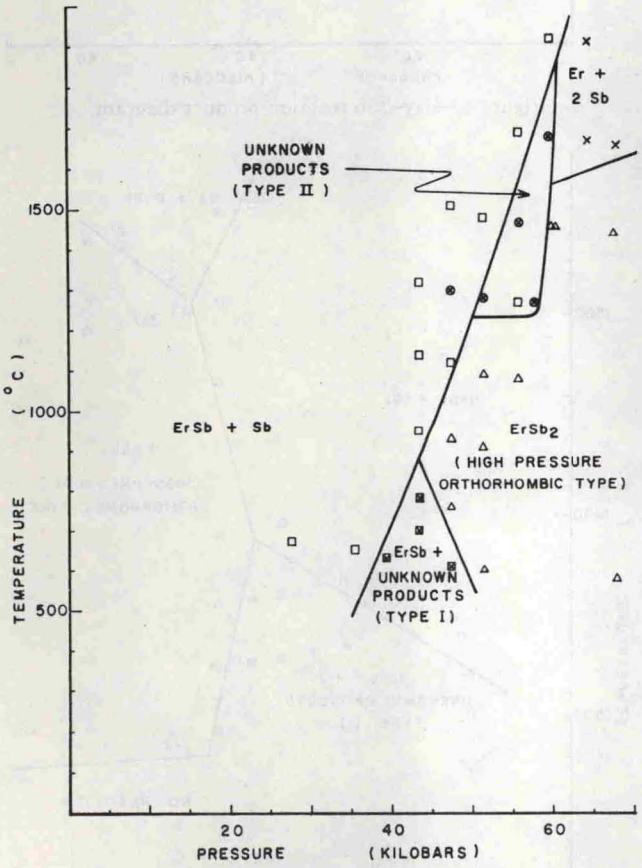

Figure 7.—Er–2Sb reaction product diagram.

tain reaction, a new phase was observed. The X-ray diffraction pattern of this phase could be indexed with an orthorhombic structure containing two molecules per unit cell. This orthorhombic structure is quite different from the $LaSb_2$ type reported for rare earth diantimonides by Wang and Steinfink.[3] This structure was called the "high-pressure orthorhombic" phase.

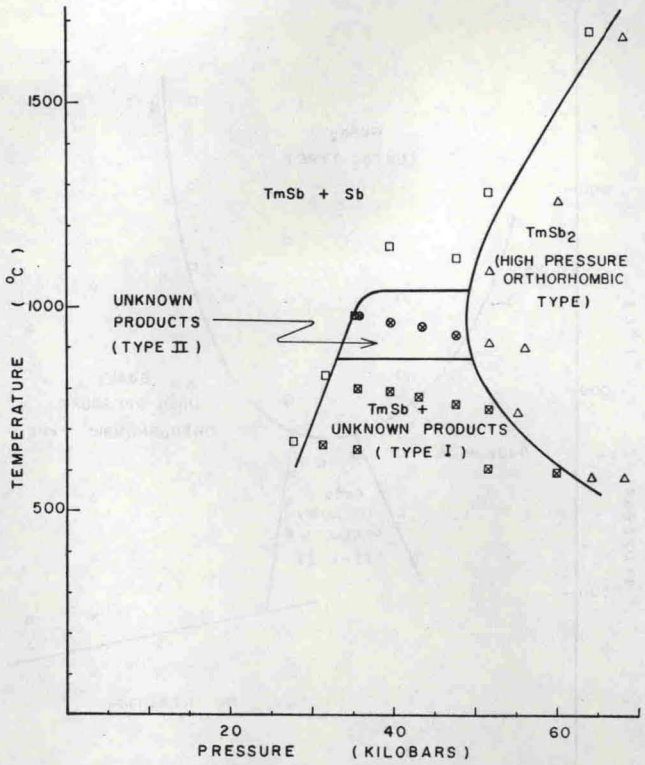

Figure 8.—Tm–2Sb reaction product diagram.

Different mixture ratios of Gd plus Sb were prepared and run at 60 kbars and 1100° to see if this high-pressure orthorhombic phase was a compound or a solid solution. For an equimolar mixture of Gd plus Sb only GdSb was formed. For a mixture of 2Gd–3Sb, the high-pressure orthorhombic structure was observed with the same lattice parameters as found in the Gd–2Sb runs. For a mixture of Gd–3Sb the same high-pressure orthorhombic structure was observed at these conditions along with excess antimony lines. Again there was no change in lattice parameters. This shows that the phase is indeed a compound and not a solid solution.

Metallographic studies were made to help identify the phases shown in the reaction product diagram of Figure 2. A polished surface of the high-pressure orthorhombic product of Figure 2 is shown in Figure 9 at magnification of 500×. An electron beam microprobe analysis of this surface was performed by Advanced Metals Research Corp., Burlington, Mass. It was reported that the globular particles (marked G) in Figure 9 contain 58.7 ± 2% Sb and 41.3 ± 2% Gd. The theoret-

Figure 9.—Polished high-pressure orthorhombic $GdSb_2$ (500×).