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QUENCHABLE HIGH-PRESSURE PHASES FROM NON-CRYSTALLINE GERMANIUM

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Quenchable products from high-pressure experiments (up to 140 kbar) on non-crystalline Ge of varying density (ρ = 4.8–6.0 g/cm^3), yield widely different results, depending on the density of the starting non-crystalline materials.

1. Introduction

The resistivity of non-crystalline Ge prepared by three different methods has been measured as a function of hydrostatic pressure to 28 kbar [1].

A pressure-induced semiconductor–metal transition has been reported for non-crystalline Ge [2–3]. It occurs at a lower pressure than the semiconductor–metal transition in crystalline Ge [4]. The metallic conduction found for the non-crystalline material between 60 and 100 kbar was ascribed to a new non-crystalline phase which, on further pressurization above 100 kbar, was thought to crystallize to the β-Sn-type structure. A similar phase has been reported for non-crystalline InSb [5]. The densification of non-crystalline Ge having a starting density lower than that of crystalline Ge, has been studied to 20 kbar; no crystallization of Ge I was found over this pressure range [6].

The phase diagram of crystalline Ge remains uncertain. Substantial differences exist between results obtained for samples quenched after long runs [7,8] and most other results [9,10].

It was decided to perform high-pressure quenching experiments on samples of non-crystalline Ge having a range in density, all prepared by sputtering techniques. The present experiments were not made to determine the position of any phase

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