Formation of Diaplectic Glass in Anorthite by Shock-Loading Experiments(Physics)

Phase-Transition Pressures of Fe_3O_4 and GaAs Determined from Shock-Compression Experiments

Y. SYONO, T. GOTO and Y. NAKAGAWA

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Shock-wave technique is used in order to observe the phase transition of two iron oxides, magnetite (Fe_3O_4) and hematite (αFe_2O_3), and two semiconductors, GaAs and GaP. Shock data up to about 500 kbar are obtained by streak-camera photography.

Phase-transition pressure in magnetite is determined from two inclined mirror runs to be 216 ± 15 kbar, which is appreciably lower than the corresponding value at static pressures, 250 ± 15 kbar.

Two inclined mirror runs for GaAs reveal a three-wave structure, yielding a Hugoniot elastic limit and apparent phase-transition pressure of 84 ± 8 kbar and 203 ± 11 kbar. If a correction due to the shear strength effect on the phase transition is taken into consideration, this value is reduced to be 162 ± 11 kbar, which is again remarkably lower than the static value of 193 ± 5 kbar or 180 ± 1 kbar. The observed discrepancy between transition pressures determined from static and dynamic means suggests a partial loss of shear strength in shocked GaAs.

Preliminary experiments on αFe_2O_3 and GaP indicate phase transitions above about 500 kbar and at about 260 kbar respectively.

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Y. SYONO, T. GOTO, Y. NAKAGAWA and M. KITAMURA

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Shock-recovery experiments on primitive anorthite have been carried out in which single crystals of anorthite are shocked to peak pressures of 150, 300, and 380 kbar, and the recovered specimen is examined by means of electron microscopy. Diaplectic glass is observed in specimens shocked above 300 kbar, and the specimen shocked to 380 kbar is found to be completely converted to diaplectic glass.

In fragments shocked to 300 kbar, the intergrowth textures of diaplectic glass and anorthite crystal are observed under an electron microscope. The diffuseness of *b* reflections in the electron diffraction pattern of intergrown crystals has no noticeable change in comparison with that of the starting specimen. The results indicate that the original configuration of antiphase domains is retained in the shocked crystal until an abrupt transition of primitive anorthite to diaplectic glass occurs. Diaplectic glass is supposed to be produced secondarily from an unquenchable high-pressure form induced under shock loading.

Temperature Dependence of Magneto-Optical Effects in Nickel Thin Films

Tsuneaki GOTO, Mitsuru HASEGAWA, Tamio NISHINOMIYA and Yasuaki NAKAGAWA

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The Faraday rotation and magnetic circular dichroism in thin films of ferro-