

General Melting Behavior at Very High Pressure: Implications For the Earth

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Melting temperatures of all classes of materials can now be measured to megabar pressures with high accuracy in the laser-heated diamond cell. At low pressures the melting slopes depend on the melting temperature, compressibility, and electronic and structural phase transitions. At high pressure all melting slopes approach a value of about 1 K/kbar. The slope of the lower mantle solidus is about 0.5 K/km

which is about twice as high as the adiabatic gradient in the lower mantle, implying an increase in the viscosity. In the lower mantle, the eutectic composition changes with increasing depth from perovskitic to one rich in magnesiowüstite. Partial melting at the core-contact and density differences allow gravitational segregation of iron-rich magnesiowüstite.