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Outlooks in Earth and Planetary Materials

In-situ high-pressure transmission electron microscopy for Earth and materials sciences

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Abstract

Transmission electron microscopy in combination with in situ high-pressure and high-temperature measurements is uniquely able to provide high-resolution data about materials under conditions resembling those in Earth's interior. By using nanocontainers made of graphitized carbon, it is possible to achieve pressures and temperatures up to at least 40 GPa and 1500 °C, respectively. A wide range of relatively simple minerals have been studied using this approach. Results to date show the influence of crystallographic defects in concentrating and storing carbon within analogs to minerals occurring deep inside Earth.

Keywords: In situ transmission electron microscopy, high-pressure measurements, carbon nanocontainers, carbon nanotubes (CNTs), carbon nanofibers (CNFs), carbon nano-onions (CNOs)