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Post-aragonite phase transformation in CaCO3 at 40 GPa

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ABSTRACT

Phase transformations of calcium carbonates ($CaCO_3$) were investigated using a laser-heated diamond anvil cell combined with a synchrotron X-ray diffraction method. Calcite, which is the stable phase at ambient conditions, transforms to aragonite at high *P-T* conditions that correspond to the uppermost part of the upper mantle. The phase transformation from aragonite to a new form of calcium carbonate was observed at pressures higher than about 40 GPa, corresponding to the lower mantle. The new carbonate has orthorhombic symmetry ($P2_12_12$) and was confirmed to remain stable at least up to 86 GPa (2000 kilometer depth). This indicates that carbon might be stored in the new calcium carbonate phase in the deep mantle.