Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.12483

Melting behavior of potassium carbonate at deep Earth conditions

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Carbonates are common rock-forming minerals and represent a dominant carbon reservoir of the Earth System, yet their melting behavior at mantle conditions remains poorly understood. Practical challenges for carbonate melting experiments include decomposition prior to melting at pressures below ~3 GPa and extreme sensitivities to pressure, temperature, and water content. Here we report new constraints on the melting curve of potassium carbonate K_2CO_3 at pressures up to 20 GPa, from *in situ* ionic conduction measurements using a large-volume press and from synchrotron X-ray diffraction measurements using laser-heated diamond anvil cells. We found that the melting temperature of K_2CO_3 increases steeply with pressure to exceed those of magnesite $MgCO_3$ and aragonite $CaCO_3$ at the mantle transition zone conditions. We will discuss the diverse thermodynamic melting properties of alkali metal and alkaline earth carbonates at high pressures and explore the implications for the long-term component of carbon cycle.