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Melting relations in the system $CaCO_3$-$MgCO_3$ at 6 GPa

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Abstract

To define the liquidus and solidus of the system $CaCO_3$-MgCO, rotating multi-anvil experiments were performed at 6 GPa in the temperature range 1300 to 1800 °C under anhydrous conditions. Additionally, experiments under hydrous conditions were performed in the Mg-rich part of the phase diagram. To determine the melting point of the end-member magnesite at 6 GPa falling sphere/body experiments were performed. The run products were analyzed using electron microprobe, Raman spectroscopy, and X-ray diffraction. Some of the run products were investigated by transmission electron microscopy (TEM).

Previous studies report tremendous quenching problems in melting experiments of carbonates, as the primary grown carbonates could not be distinguished from the quenched melt. With the help of rotating multi-anvil experiments the primary grown crystals could be separated from the melt phase and the compositions of both phases could be analyzed by electron microprobe. Compared with the results of static experiments the corresponding phase diagram under anhydrous conditions is significantly different. The anhydrous melting point of $MgCO_3$ at 6 GPa could be located between 1750 and 1800 °C. Under hydrous conditions liquidus and solidus moved to lower temperatures compared to anhydrous conditions and the melting point of hydrous $MgCO_3$ at 6 GPa is located between 1700 and 1750 °C.

Keywords: Carbonate, melt, magnesite, multi-anvil press