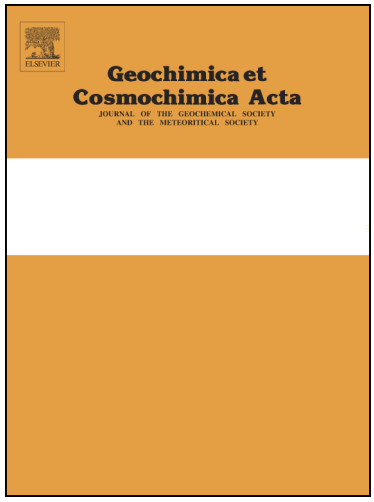

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Investigation of organo-carbonate associations in carbonaceous chondrites by Raman spectroscopy

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ABSTRACT

Carbonates record information regarding the timing, nature and conditions of the fluids circulating through asteroid parent bodies during aqueous alteration events. Determining carbonate abundances and their relationships with organic matter improves our understanding of the genesis of major carbonaceous components in chondritic materials. In this study, five CM2 carbonaceous chondrites (CM2.2 Nogoya, CM2.3 Jbilet Winselwan, CM2.5 Murchison, CM2 Santa Cruz, and CM2TII Wisconsin Range 91600) were studied with Raman spectroscopy. Carbonates were identified in these meteorite samples by the distinctive Raman band in the ~1100 cm^{-1} region, representing the symmetric stretching vibration mode (v_1) of the $(CO_3)^{2-}$ anion. Carbonates identified in the meteorite samples are all calcite, with the exception of a single dolomite grain in Nogoya. The v_1 positions of the CM calcites are 2–3 cm^{-1} higher than in pure calcite, which suggests that they contain significant impurity cations. Typical graphitic first-order D and G bands were identified in the meteorite matrix as well as in ~25% of the analyzed carbonate grains. From the Raman results, we postulate that the carbonates might not have formed under equilibrium conditions from a single fluid. The first