

Heavy metals incorporated in calcite changed its dissolution process

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Due to the high capacity of impurities in structure, calcite is regarded as one of the most attractive minerals to trap heavy metals (HM) via substitution during co-precipitation / crystal growth. As a high reactivity mineral, calcite might release heavy metals via dissolution. However, it is unclear that the influence of heavy metals on the dissolution of calcite. Therefore, we synthesized calcite incorporated with Co, Ni, Cu, Zn, Mn, Cd and U, respectively and investigated its dissolution behavior.

According to the solution chemical analysis, these heavy metals can be divided into three groups, group I (Cd, Ni), group II (Co, Cu, Mn) and group III (U, Zn). Group I inhibited the dissolution of calcite, while group II enhanced the dissolution up to 238% comparing to the control sample. It is surprised that group III showed inhibition at low content and enhancement at high content. Meanwhile, the molar ratios of aqueous Ca/M were normally different with the ratios in the original solids, suggesting nonstoichiometric release of Ca and HM.

SEM and TEM observations revealed that rhodochrosite (MnCO_3) (Fig. 1) and malachite ($\text{Cu}_2(\text{OH})_2\text{CO}_3$) formed during the dissolution of Mn/Cu incorporated calcite. Our results suggest that the impurities in calcite can change the dissolution process of calcite significantly, and control the environmental behavior of heavy metals.

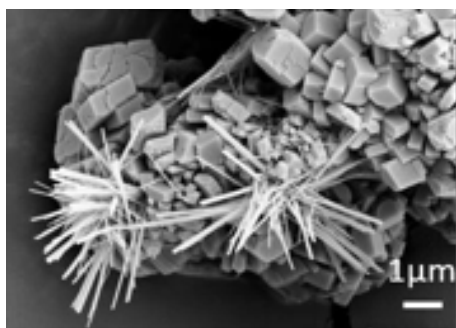


Fig.1, Rhodochrosite precipitated during the dissolution of calcite incorporated with Mn