Goldschmidt2020 Abstract

Stable isotope composition of dawsonite from different environments: implication for constrain the origin and formation condition

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Dawsonite [$NaAlCO_3(OH)_2$] is reported to be abundant in natural reservoirs that are currently at a high CO_2 pressure, or that have previously experienced an influx of CO_2. Hence, its presence in natural systems can provide useful information regarding the chemical and physical processes, which play a crucial role during geological sotrage of CO_2 as part of the CCS (Carbon Capture and Storage) process. However, dawsonite fomation conditions, its stable isotope behavior, fractionation are not well constrained. Here, first time we show new stable C, O, H isotopic composition of dawsonite, separated from other carbonate minerals from three fields: Mihályi-Répcelak area (Hungary) (MR), Covasna (Romania) (COV) and St. Johns Dome (United States) (JD) that formed under different environments. The $\delta^{13}C_{MR}$ values of dawsonite from 1.6‰ to 1.3‰, $_{C}\delta^{13}C_{COV}$ data falls between 7.9‰ to 10.1‰ and the $\delta^{13}C_{JD}$ are from -0.4‰ to 2.8‰. The $\delta^{13}C$ values of CO_2 gas phase ($\delta^{13}C_{MR}$:-4.6‰ to -2.7‰, $\delta^{13}C_{COV}$: -4.7‰ to -1.4‰, $\delta^{13}C_{JD}$: -3.6‰) of all investigated area confirms magmatic origin of CO_2. The $\delta^{13}C_{PDB}$ and $\delta^{18}O_{SMOW}$ values of dawsonite from the different settings show positive correlation covering a broard range, which is likely related to the different formation conditions and composition of the parent fluids.

The hydrogen isotopic compositions first time measured in dawsonites provide information on the origin of the pore fluid present during dawsonite formation.

This project was financially supported by NKFIH project (K 131353 for Gy. Falus).