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Petrographic and stable isotopic evidences of CO_2-induced alterations in sandstones in the Lishui sag, East China Sea Basin, China

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Abstract: Dawsonite-bearing sandstones in the Lishui sag, East China Sea Basin, China, have been investigated as a natural occurrence for CO_2-induced diagenesis using petrography, X-ray diffraction and stable isotopes. The sandstones are predominantly litharenite, with the order of cements growth comprising clay coatings and pyrite Ⅰ, siderite, pyrite Ⅱ, quartz overgrowths, ankerite, kaolinite and microcrystalline quartz, dawsonite and late calcite. Dawsonite, which has recently been considered as trapping mineral after massive CO_2 charging, constituted up to 7% of the whole rock volume, occurring as pore-filling clusters or replacement of detrital grains. Stable isotopic data suggest that the CO_2 in equilibrium with dawsonite and calcite display a mantle-magmatic origin and is in close proximity to those of the CO_2 gas now present in the reservoir, indicating the same origin for both. The elevated CO_2 concentrations induced by a mass influx of magmatic CO_2 into host rock was favorable for dawsonite cementation. Plagioclase was then considered as the precursor of dawsonite. K-feldspar could also serve as the aluminum source of dawsonite with an external supply of Na^+ in a geochemically open system.

Keywords: CO_2; petrology; stable isotope; dawsonite; Lishui sag

1. Introduction

Anthropogenic CO_2 emissions are generally considered to be responsible for