Unlocking New Potential in Partially Dolomitized Reservoir: Insight from Dolomitization Reaction Fronts

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ABSTRACT

Hydrothermal dolomite (HTD) are distributed worldwide and proven to hold major hydrocarbon reserves, especially in the Western Canada Sedimentary Basin (WCSB) and the Middle East. However, recent studies have indicated that the mechanisms and fluid sources for HTD dolomitization are equivocal; hence their impact on reservoir properties is difficult to predict. This uncertainty is also reflected in the formation of distinct dolomitization fronts. While dolomitization is critical in controlling the texture and petrophysical properties of carbonate rocks, the processes governing the formation of dolomitization fronts are poorly described. This study utilizes a suite of dolomitization fronts in HTD from a Cambrian carbonate platform, WCSB to establish the controls on their shape, size and position. Pilot petrographic-cathodoluminescence and geochemical studies indicate that the dolomite texture becomes more sucrosic, porous and less stoichiometric toward the reaction fronts. We are testing the hypothesis that the earliest stage of dolomitization is recorded in the reaction fronts and over-dolomitization has occurred closer the fluid source through repeated recrystallization events. This project will test the hypothesis by conducting clumped isotope analysis across the HTD bodies that will be coupled with fluid inclusion and stable isotopic data to unravel the fluid composition and temperature-salinity variations during multistage dolomitization. The results will then be compared to other study locations to build a robust predictive model for the style of dolomitization fronts and their impact on reservoir heterogeneity in HTD systems. Ultimately, understanding these processes will help to improve prediction of the reservoir quality evolution of HTD reservoirs worldwide.

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