Hydrothermal dolomitization in the St. George Group, western Newfoundland

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The Lower Ordovician St. George Group in Western Newfoundland consists of a sequence of subtidal and peritidal carbonates deposited on the on the southern margin of Laurentia during the Late-Proterozoic break-up of Rodinia. These carbonates are extensively dolomitized and are potential hydrocarbon reservoirs. The St. George Group dolomites are classified, based on petrography and cathodoluminescence, into three main generations (D_1, D_2, and D_3). Early and pervasive replacement dolomicrite (D_1) is fine grained and indicates that dolomitisation began during early stages of diagenesis at almost near-surface conditions. Later stage replacement dolomites (D_2) are associated with enhancement in porosity through the development of intercrystalline pores, while latest stage saddle dolomite (D_3) and late burial calcite cements significantly occluded the pores in some horizons. Fluid-inclusion homogenization temperatures range from 60 to 130°C for D_2 dolomites and from 85 to 145°C for D_3 dolomites, and are generally higher than temperatures predicted from burial histories. This implies that D_2 and D_3 dolomites were formed from warm, saline (up to 25 eq. mass% NaCl) fluids of hydrothermal origin. Stable isotope data indicates that these fluids are basinal in origin.

The occurrence of high porosity associated with D_2, combined with tight limestone beds, presence of favourable source rocks, and thermal maturation, indicates that hydrothermal dolomite plays in the St. George Group carbonates are possible potential hydrocarbon reservoirs and suitable targets for future hydrocarbon exploration in western Newfoundland.

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