

Divergent Fluid Regimes and the Formation of Hydrothermal Dolomite: Examples from Devonian Reservoirs in the Western Canada Sedimentary Basin

Al-Aasm, Ihsan¹, Jeffrey Packard² (1) University of Windsor, Windsor, ON (2) Burlington Resources, Calgary, AB

Hydrothermal dolomites and apparently allied processes, such as effluent leaching and hot silicification have been described from numerous Devonian carbonate reservoirs in Alberta and British Columbia. Its presence has been used as an indicator of the interaction of high-temperature hydrothermal fluids with host carbonates due to tectonic influences in the Western Canada Sedimentary Basin (WCSB). The timing of the fluid flow events that precipitated these dolomites and the chemistry of these fluids has been the basis of many arguments. The Wabamun Group of WCSB is no stranger to dolomitization. In southern and southeastern Alberta the Wabamun carbonates are almost exclusively dolostone. To the north and west in Alberta and into British Columbia, quite the opposite is true, with less than an estimated 0.5% of the total Wabamun Group represented by dolostone. One would suspect that the agents and fluid-flow regimes responsible for these different occurrences would be substantively different. Basin-wide, ongoing Wabamun study, suggest that this discrimination may be possible but is commonly obscured by “significant” recrystallization. Dolomitization by very saline brines occurred under a broad continuum of temperature regimes (as determined by fluid inclusion and stable isotope studies), that were prevalent during shallow to intermediate burial. Superhot (165°C or greater) conditions apparently prevailed in the northwest (e.g. Monias), indications of scalding temperatures (85-125°C) are common over much of the Peace River Arch area (e.g. Tangent, Eaglesham, Gold Creek, Pine Creek), whereas hot temperatures (60-90°C) predominate in pools surrounding the Wild River Basin (e.g. Medicine Lodge, Berland River). Lukewarm temperatures (30-50°C) are observed for the Crossfield trend.