Feldspar diagenesis and its significance for sandstone reservoirs in the Scotian Basin

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Diagenesis of K-feldspar and plagioclase are among the most significant changes occurring in sandstone during burial diagenesis. Sixteen representative samples at various depths from eight exploratory wells in the Scotian Basin were selected for detailed study of the diagenesis of the detrital feldspars, to evaluate the roles played by sedimentary facies (which influence porosity and permeability), geographic location (controlling the type of detrital supply), burial depth, temperature and salinity as recorded by fluid inclusions, and the structural setting of the sandstones. K-feldspar authigenesis starts at ~1900 m depth as K-feldspar overgrowths on detrital K-feldspar grains, or as cement that fills fractures in fractured K-feldspar, and continues to 3000 m. Albitization of K-feldspar also starts at ~1900 m, with diagenetic albite following weakness paths and at greater depths, K-feldspar disappears through dissolution and/or replacement by ferroan calcite ± ankerite. K-feldspars disappear between 3 800 and 4 500 m. Detrital plagioclase is either oligoclase or albite. Early patches of diagenetic albite in detrital albite grains give way with depth to albite pseudomorphs or partially dissolved albite grains, containing large pores. Albite pseudomorphs predate late ankerite cement. Detrital oligoclase is first replaced at depths > 3 700 m by diagenetic albite as overgrowths or irregular patches with straight crystal outlines. Diagenetic albite is much more abundant in thick sandstone units than in thin sandstone beds with interbedded mudstone, probably because such sandstones were pathways for flux of basinal fluids. It is more abundant, in the same facies and depth, in the Thebaud–Glenelg fields, where fluid inclusions in silica and carbonate cements are ~21% NaCl compared with the eastern part of the basin where fluid inclusions are ~10% NaCl and probably a little cooler. Dissolution of K-feldspar seems predominantly controlled by burial depth, but is most severe in permeable thick sandstone units.

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