

Sedimentology and Diagenesis of the Scollard Sandstones in South-central Alberta

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The petrography of the Scollard Formation sandstones in south-central Alberta is defined by litharenites and sublitharenites, which accumulated in dominantly fluvial environments. Detail facies analysis shows that fluvial styles changed from higher energy, braided type, in the lower part of the Formation, to lower energy, meandering type, in the upper part. Significant climatic fluctuations appear to have occurred during the accumulation of the Scollard Formation. This conclusion is supported by oxygen and carbon isotopes, changes in the composition of the sandstone framework constituents, as well as changes in the nature of the authigenic clay minerals.

The early diagenesis of the Scollard sandstones is characterized by initial mechanical compaction; calcite cementation; authigenic quartz overgrowth; formation of authigenic clay minerals as coatings and rims; pore-lining clay minerals; early clay pore-fills; and early dissolution of detrital feldspars along with dissolution of volcanic fragments. Burial diagenesis is dominated by the precipitation of authigenic quartz and pore-filling kaolinite; dissolution of feldspar grains; corrosion and dissolution of quartz grains and authigenic silica; alteration of mica, biotite and iron bearing minerals; dissolution of calcite cement; and precipitation of hematite cement.

Initial mechanical compaction, pore-filling clay minerals, and calcite cement substantially reduced the primary porosity in sandstones. However, in certain facies, a relatively high percentage of the primary porosity was preserved by the early formation of clay rims and coats that inhibited further cementation. This outcrop study may provide a good analog for the reservoir characterization of other fluvial sandstones in the subsurface of the Western Canada Basin.