

Permeability Development in Ordovician and Mississippian Dolomites, Wyoming and Montana

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ABSTRACT

Petrologic studies were made of selected cored intervals from two U.S. Geological Survey test holes; one in Sec. 15, T. 57 N., R. 65 W., Crook County, Wyoming, the other in Sec. 18, T. 1 N., R. 54 E., Custer County, Montana. The studies were mainly of the Ordovician Red River Formation and the Mississippian Madison Group (Formation) and included thin-section and x-ray-diffraction analysis, porosity and permeability determination, $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ analysis, and sodium-and strontium-content analysis. The studies showed that:

1. Zones of the high transmissivity in the Red River Formation are generated by removal of anhydrite.
2. Permeability distribution in the Madison Group (Limestone) is controlled by the environments of deposition with the zones of high transmissivity being associated with penecontemporaneous reflux dolomitization during deposition of supratidal hypersaline facies.
3. Hypersaline and reflux dolomites in the Madison Group (Limestone) contain amounts of sodium greater than interbedded open-marine calcites.
4. The strontium in these dolomites suggest aragonitic precursors.
5. Precipitation of calcite results from the solution of anhydrite, and this secondary calcite shows an isotopic composition consistent with calcite which could precipitate from present day ground waters.

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