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Preliminary Fluid Inclusion Evidence for the Mechanism of Dolomitization in the Lower Permian Chase Group, Hugoton Embayment, Southwest Kansas: Abstract

Bryan J. Bergmann[1], John A. Luczaj[2]

ABSTRACT

Primary fluid inclusions in dolomite from the lower Krider Limestone of the Mobil Nix #1 Unit #3 well and the base of the Winfield Limestone of the Mobil Clair Curry Unit #3 well in southwestern Kansas were analyzed to determine the salinity, temperature, major ions, and gas content of fluids responsible for dolomitization.

Dolomite rhombs show growth zonation with inclusion-rich cores and clear, inclusion-free rims. Both one-phase and two-phase aqueous fluid inclusions are present in the inclusion-rich cores. Melting temperatures of ice range from -17.5 degrees C to -22.8 degrees C (20.6 to 24.2 weight % NaCl equivalent). Homogenization temperatures range from 56.9 degrees C to 128 degrees C, with 85% between 75 degrees C and 95 degrees C. Eutectic melting temperatures were observed at -57 degrees C for the Nix well and -52 degrees C for the Clair Curry well indicating model compositions of Na-Ca-Mg-Cl-rich and Na-Ca-Cl-rich fluids, respectively. Intermediate melting temperatures between ~- 42 degrees and -38 degrees C were observed but were not interpretable. Crushing runs reveal the vapor phase contains an exsolved gas of unknown composition at pressures between 5 to 35 bars at room temperature.

Cathodoluminescence petrography reveals three growth zones that are especially well developed in dolomite of the Clair Curry well. Zone 1 (inclusion- rich core) is dull but contains some bright areas suggestive of recrystallization of an originally dull rhomb. Zone 2 (inner zone of clear rim) is bright and exhibits polyhedral crystal growth. Zone 3 (outer zone of clear rim) is dull and rhombic.

The presence of one-phase and two-phase inclusions within the cores of dolomite crystals suggests that highly saline fluids were entrapped below about 50 degrees C and subsequently re-equilibrated (by leakage and refilling or by recrystallization). A possible-model responsible for the dolomitization involves refluxing of brines followed by re-equilibration of inclusions by warm brines migrating cratonward from the Anadarko Basin.

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1 University of Kansas, Lawrence, KS

2 University of Kansas, Lawrence, KS