Structurally-Controlled Hydrothermal Dolomitization in an Extensional Regime- a Case Study of the Cretaceous Qamchuqa Formation, Zagros Basin, Kurdistan Iraq

Kareem H. Kareem[1], Ihsan S. Al-Aasm[1], and Howri Mansurbeg[2]

[1]University of Windsor
[2]Soran University

Abstract

Structurally-controlled hydrothermal dolostone hosts many hydrocarbon reservoirs worldwide and hence has been of high interest for exploration by oil companies. The Lower Cretaceous Qamchuqa Formation includes one of these major reservoirs in the Middle East. Qamchuqa Formation is divided into upper and lower units based on faunal contents. The convergence and collision between the Arabian and Eurasian plates resulted in two major folding phases at the end of Cretaceous and Pliocene times. Fracturing, dolomitization and other diagenetic processes affected these carbonates that contributed to the good porosity and development of reservoir characteristics, which make the foreland basin Qamchuqa Formation one of the main targets for oil exploration in most of the oil fields of Iraq. The role of tectonics in a foreland basin setting as related to fracturing, fluid flow and dolomitization have not been investigated in details in the region before. This study will provide an ideal example of the role of thrusting and tectonics in controlling diagenetic fluids and modifying reservoir characteristics. Integration of detailed field, petrographic and geochemical data from fractured dolostones demonstrate different phases of fluid movement during active phase (s) of tectonic cycles in the Zagros region from late Cretaceous to early Neogene time. High resolution sampling of outcrops from 16 different sections along more than 2 km and drill cores from two wells show significant relationships between zebra texture in dolomite and fracture zones, resulting from multiple pulses of hydrothermal fluid flow. These pulses also resulted in dissolution and /or precipitation of hydrothermal saddle dolomite, and later coarse crystalline calcite cement. Earlier data from stable isotopes show that saddle dolomite and host dolostones have similar stable isotopic composition. Enhanced reservoir characteristics are associated with intervals that contain large volume of hydrothermally affected zones. This present study demonstrates the linkage between fluid flux history and related diagenesis to the tectonic evolution of the Zagros Basin.