

Hydrothermal Dolomitization - Yet Another Overblown Bandwagon?!

H.G. Machel, University of Alberta, J. Lonnee, Shell International E&P

The latest bandwagon to roll through the dolomite research community is the "hydrothermal dolomite model". This bandwagon originated in Canada in the late 1990s and is founded on four major assumptions: all saddle dolomite is hydrothermal; matrix dolomite is hydrothermal on a regional scale; saddle and matrix dolomites are co-genetic; hydrothermal activity was basin-wide. In Western Canada, all four assumptions have been shown to be incorrect or correct only locally. Rather, most dolostones south of the Peace River Arch formed under normal burial conditions. The few hydrothermal dolomite bodies are related to faulting and are not of regional extent. However, north of the Peace River Arch regional heat flow has been higher than normal, and several large dolostone bodies are hydrothermal. Yet even here it is contentious just how much dolomite was formed from hydrothermal fluids. Petrography and geochemistry show that hydrothermal fluids often are initially undersaturated with respect to dolomite and thus dissolve older dolomites, with concurrent generation of porosity and solution collapse brecciation. These fluids may evolve toward dolomite supersaturation and form saddle dolomite, which often form conspicuous but volumetrically minor amounts of cement. Thus, many so-called "hydrothermal dolomite" hydrocarbon reservoirs are not cases of hydrothermal dolomitization. Rather, they acquired their high porosities and permeabilities from hydrothermal karstification of older, relatively low-temperature dolomites, and the actual hydrothermal dolomite formation destroyed rather than formed porosity and permeability. These findings have important implications for hydrocarbon exploration. Also, like many other bandwagons before, the hydrothermal dolomite bandwagon is very much overblown.