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Hydrothermal Hydrocarbon Systems

Recently hydrothermal dolomite and its relation to hydrocarbon accumulations have captured the attention of the petroleum industry. An inclusive definition of the hydrothermal hydrocarbon system, in which dolomite is only one component, yields new, geneses-based models for finding oil and gas. Distinguishing features of the hydrothermal hydrocarbon system include diagenetic products and late stage porosity enhancement. Most recognized hydrothermal hydrocarbon accumulations occur in carbonate reservoirs, but clastic units are also affected by hydrothermal systems. Typically, hydrothermally altered reservoirs are found in relatively undeformed rocks adjacent to foreland basins or within the leading structures of fold belts. At the basin scale, hydrothermal system may produce several accumulation types having different reservoir characteristics. However, accumulations within different areas of the basin form districts containing many similar fields. Hydrothermal accumulations are localized by facies tracts, edges of sandstone or shale units, breccias, and reactivated faults. Within districts, accumulations share one or more of these features. Development of districts suggests that horizontal fluid migration is more effective than vertical migration and implies that vertical conduits are connected to regional aquifers. Diagenesis in carbonates results in dolomitization, brecciation, calcite or sulfate dissolution and authigenic growth of feldspar or clay. In clastic units, dissolution of carbonate cements, feldspar grains and development of authigenic clays are common. Fluid inclusion data suggests that the hydrothermal fluids are basinal brines with low Ph and Eh containing 10 – 30 weight percent salt. Modifications of the fluid composition during migration and changes in the host rock explain variability between districts.