

Mississippi Valley-Type Lead-Zinc Ore Deposits, Hydrothermal Dolomite and Hydrocarbon Reservoirs

D. Leach, U.S. Geological Survey

Current interest in "hydrothermal dolomite" in the hydrocarbon industry and the resurgence in exploration for Mississippi Valley-type (MVT) leadzinc deposits have led to renewed attention to the links between MVT deposits and hydrocarbon reservoirs containing "hydrothermal dolomite" or coarse, sparry dolomite. Some of the recent literature on hydrothermal dolomite commonly contains questionable fluid inclusion data on dolomite, as well as obtuse interpretations of dolostone fabrics, dissolution collapse breccias, and dolomite replacement features, which together obscure understanding of what is hydrothermal dolomite and what is not. New results in the field of economic geology help define the links between the formation of MVT deposits and the alteration and/or dissolution of carbonate rocks associated with MVT ores and sulfidebarren dolomite bodies that host hydrocarbon resources. The precipitation of dolomite in MVT deposits depends on the composition of the ore-forming fluids, the geochemical reactions that produce ore, and the carbonate host lithology. Fluid mixing in limestone can cause significant calcite dissolution and dolomite precipitation independent of ore deposition, thus explaining some massive hydrothermal dolomite bodies devoid of sulfides. This process may have played a role in porosity development in the Appalachian basin's Trenton-Black River hydrocarbon play. Pervasive replacement of pre-existing dolostone by hydrothermal dolomite associated with mineralization in dolostone is typically limited to narrow zones (< several hundred meters) surrounding the ore deposits. Some large MVT ore systems deposited sparry dolomite cement in a variety of open spaces (e.g., fractures, vuggy porosity and carbonate dissolution features) for hundreds of kilometers in dolostone aquifers.