

Fluid Inclusion Chemistry in the Exploration for Mississippi Valley-type Deposits: An Example from East Tennessee

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SEM energy dispersive analyses of fluid inclusion decrepitates in sphalerite and dolomite from the Mascot-Jefferson City Mississippi Valley-type district of East Tennessee reveal a marked increase in the Ca/Na ratio of fluids associated with ore. These high Ca contents have been interpreted as being the result of limestone dissolution at or near the site of mineralization caused by the acid-producing, sulfide depositing reaction ($\text{ZnCl}_2 + \text{H}_2\text{S} = \text{ZnS} + 2\text{HCl}$). The exploration potential of this variation in fluid inclusion chemistry was evaluated by analyzing fluid inclusion decrepitates from white sparry dolomite along a 500-m traverse in the New Market Mine. The traverse extends from the central portion of a large domal collapse-breccia orebody with > 3% Zn, into the dolomite-veined but unmineralized Knox Group limestone. Dolomite stratigraphy (revealed by cathodoluminescence) was used to distinguish contemporaneous dolomite zones and only decrepitates from similar zones were compared.

$\text{CaCl}_2/\text{NaCl}$ ratios as high as 1.2 were common in dolomite-hosted decrepitates from the high-grade collapse one, and low grade (< 1.0% Zn) portions within the collapse zone also contained Ca-rich decrepitates. This anomalous decrepitate chemistry was not observed in gangue dolomite outside the ore zone; dolomite gangue less than 50 m from the "limestone edge" yielded background $\text{CaCl}_2/\text{NaCl}$ ratios (0.2–0.5). Although the data from this traverse indicate that anomalies in decrepitate chemistry are too local to be of use in regional exploration, the method could prove useful in evaluating the potential of areas adjacent to drilled intercepts containing marginal (0.5–1.5% Zn) mineralization.