Vanadium Chlorite from a Sandstone-Hosted Vanadium-Uranium Deposit, Henry Basin, Utah

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Abstract: An unusual vanadium chlorite precipitated during the formation of a vanadium-uranium ore deposit in the Henry Basin, southeastern Utah. The ore deposit formed by reduction and precipitation of U and V in the presence of organic matter at the interface between a stagnant brine and overlying, circulating meteoric water. Some samples of the vanadium chlorite (heated before analysis) contain $\geqslant$ 10% V_2O_5. In fresh samples, most of the vanadium is in the trivalent oxidation state. X-ray powder diffraction data suggest that Fe and V are concentrated preferentially in the interlayer hydroxide sheets of the chlorite. A d(060) value of 1.52 Å indicates that the chlorite probably has a dioctahedral structure which is distended by the presence of octahedral Fe and V. The vanadium ore zone is flanked by peripheral zones containing perfectly ordered chlorite/smectite. This chlorite/smectite contains much less V than the pure chlorite. This chlorite may have formed by the progressive precipitation of vanadium-rich interlayer hydroxide sheets in the mixed-layer chlorite/smectite in the most reducing portion of the ore zone. The pure chlorite is a *IIb* polytype, which, for nonvanadiferous analogs, is ordinarily found in high-temperature environments; however, no evidence exists to show that these rocks have ever been exposed to elevated temperatures. In fact, the presence of unreacted smectite in a potassium-rich setting and the low vitrinite reflectance of coalified plant debris indicate a low-temperature history for these sediments.

Key Words: Chlorite • Chlorite/smectite • Corrensite • Diagenesis • Tosudite • Uranium • Vanadium • X-ray powder diffraction

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