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Berthierine/chamosite, corrensite, and discrete chlorite from evolved verdine and evaporite-associated facies in the Jurassic Sundance Formation, Wyoming

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ABSTRACT

Late Jurassic sandstones of the shallow-marine Sundance Formation contain authigenic chlorite minerals that occur as rosette-like pore fillings of interstratified berthierine/chamosite (B-C) and honeycomb-like pore linings of corrensite and discrete chlorite. B-C is nearly ubiquitous in Sundance sandstones, but is absent near the top of the formation, whereas corrensite and discrete chlorite were detected only in uppermost Sundance sandstones, within 4 m of the contact with the overlying non-marine Morrison Formation. Glauconite grains are common and occur as laminae along bedding planes and cross-beds, indicating reworking and deposition as clasts in tidally influenced regimes.

The mineralogical, chemical, and morphological properties of the B-C and corrensite indicate that they are authigenic and formed during burial diagenesis from precursor minerals, odinite in the case of B-C, and saponite in the case of corrensite and discrete chlorite. Odinite has been recognized in numerous shallow-marine sands of the Holocene verdine facies, and the shallow-marine conditions associated with Sundance deposition would have been ideal for odinite formation. Saponite commonly forms in aeolian and evaporitic environments, implying that the saponite precursor to corrensite and discrete chlorite formed in uppermost Sundance sands that were exposed to an influx of oxidizing groundwater following regression of the Sundance sea.

X-ray diffraction (XRD) indicates that the proportion of 7 Å B layers in B-C ranges from 5 to 28%, and chemical analysis by scanning electron microscope-energy dispersive X-ray spectrometry (SEM-EDS) indicates positive correlation between %B and Fe/(Fe + Mg). The polytype of the B-C is *Ibb*, and the corrensite and discrete chlorite are disordered *IIb*. These are the expected polytypes and %B for sandstones exposed to burial diagenetic conditions of 3000–4000 m and temperatures 90–120 °C.