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# Relationship Between Illite/Smectite Diagenesis and Hydrocarbon Generation in Lower Cretaceous Mowry and Skull Creek Shales of the Northern Rocky Mountain Area

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**Abstract:** The percentage of expandable layers in illite/smectite (I/S) mixed-layer clay decreases with increasing temperature and depth in a section through marine Cretaceous shales in the Champlin 1 Hartley Federal well in the Powder River basin, Wyoming. This systematic change in I/S expandability is evidence that low-expandable I/S in Cretaceous shales of the northern Rocky Mountain area reflects, at least in part, thermal alteration during burial diagenesis. In eastern Montana and western North Dakota where I/S in the Lower Cretaceous Mowry and Skull Creek source rocks is diagenetically unaltered, only trace amounts of hydrocarbons have been found in the Lower Cretaceous and other Cretaceous sandstones. Elsewhere in the northern Rocky Mountain-Great Plains region, hydrocarbons in the Lower Cretaceous Muddy Sandstone and its equivalents occur within or immediately adjacent to areas in which I/S clay in the Mowry and Skull Creek shales has been diagenetically altered during burial. Altered I/S and thermally mature organic matter, as defined by Rock-Eval pyrolysis values, coexist in these source rocks. Both may be used as maturation indicators in the search for Cretaceous-source hydrocarbons in the northern Rocky Mountain area.

**Key Words:** Diagenesis • Hydrocarbon • Illite/smectite • Interstratification • Maturation • Pyrolysis • Shale

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