# Comparison of the Mineralogical and Chemical Composition of 2 Shales from the Western Canada Sedimentary Basin and the United States Gulf Coast

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**Abstract:** The mineralogy and geochemistry of shales reflect the composition of the initially deposited precursor mud, subsequently modified by diagenetic processes. To see if significant geochemical differences exist between shales that mainly owe their present-day composition to either deposition or diagenesis, we compare the published mineralogical, bulk and clay-fraction geochemical, and clay-fraction O-isotopic compositions of 2 shales. One shale is from the Western Canada Sedimentary Basin (WCSB), and its composition mainly reflects primary (depositional) chemical and mineralogical variations (smectitic to illitic illite/smectite) within this unit. The other shale is from the United States Gulf Coast (USGC), and its composition mainly reflects mixed-layer illite/smectite (I/S) diagenesis of deposited smectitic clay material. The chemical and mineralogical trends of WCSB and USGC shales, including one of increasing illite content in I/S with depth or maturity, are essentially indistinguishable, in both bulk shale and clay fraction, despite the contrasting genetic interpretations for the origin of the contained I/S. Thus, similar mineralogical and chemical trends with depth or temperature can result either from inherited depositional compositional heterogeneity of the sediment, from burial metamorphism of shale or a combination of both. Interestingly, the O-isotopic compositions of the clay fractions from the WCSB and USGC are significantly different, a fact that reflects original clay formation from source material and water of quite different isotopic compositions. The discrimination between depositional and diagenetic contributions to shale composition continues to pose challenges, but a combination of bentonite, illite polytype, clay isotopic and trace and rare earth elemental analyses together with illite age analysis holds promise for future work.

**Key Words:** Deposition • Diagenesis • Geochemistry • Mineralogy • Mixed-Layer Illite/Smectite • Oxygen Isotopes

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