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# Shale Diagenesis: A Case Study from the Albian Harmon Member (Peace River Formation), Western Canada

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**Abstract:** Shales have often been cited as the source of authigenic material that occurs in coarser grained sediments, but there are few comprehensive studies of diagenesis in shales that rigorously attempt to determine if they are sources for potentially mobile constituents or if they retain those constituents within the shale body. The silicate diagenesis of a Lower Cretaceous marine mudstone, the Harmon Member, was investigated by determining the bulk chemistry, clay mineral compositions and mineral modes using standard analytical techniques and linear programming. Changes in mineralogy are observed in hemipelagic laminated mudstones (LM) that are attributable to diagenesis despite relatively constant bulk compositions. These include authigenic kaolinite formation and illitization of detrital muscovite, K-feldspar and authigenic kaolinite. No diagenetic trends in mineralogy are observed in rapid and episodically deposited transition zone (TZ) sediments because of primary (depositional) mineralogical variability. Diagenetic changes in mineral modes for shales of the Harmon Member are small, suggesting that silicate diagenesis proceeds under relatively "closed system" conditions. The occurrence of authigenic quartz suggests that much of the Si released from the dissolution of quartz and chert is precipitated within the Harmon Member. Al, Ti, and K apparently are conserved. Burial induced increase in temperature is inferred to be the primary control on silicate diagenesis within the Harmon Member.

**Key Words:** Clay mineralogy • Quantitative shale mineralogy • Silicate diagenesis

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