

Petrologic and Geochemical Controls on Diagenesis for the Nanushuk Formation, North Slope, Alaska

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Fine grained sandstone units within the Nanushuk Formation (Cretaceous) from Umiat, Alaska informally known as the upper and lower “Grandstand” occur as two distinct bodies. Detailed petrographic observations from Umiat wells 9 and 11 provide insight into the compositional variations, cement types, evidence of early diagenetic processes, and evidence of pore-filling authigenic clay minerals. Photomicrographs show features characteristic of compaction, such as flexible grain deformation and sutured grain boundaries formed as a result of pressure solution. Silica overgrowths are observed on quartz sand grains and represent a majority of the cement in the Grandstand. Detrital and authigenic clay minerals are distinguished based on birefringence and in situ dissolution of feldspar grains. There is evidence that these clay minerals have infiltrated much of the original pore space of the sandstone. This provides important information about the porosity and permeability of the Nanushuk Formation. Scanning electron microscope (SEM) imaging provides a higher degree of detail of the petrographic observations. These images show the morphology of the detrital and authigenic clay minerals at the micron level. Feldspar dissolution has also been imaged in order to see if albitization is a key process in the diagenesis of the Nanushuk formation. Electron microprobe data provide compositional variations of the feldspar grains, cements, as well as detrital and authigenic clay minerals of the upper and lower “Grandstand”.