Fe Substitution for Al in Glauconite with Increasing Diagenesis in the First Wilcox Sandstone (Lower Eocene), Livingston Parish, Louisiana

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Abstract: Glauconites in early ankerite concretions, ferroan calcite-cemented sandstones, and uncemented sandstones in the first Wilcox sandstone of the Lockhart Crossing field, Livingston Parish, Louisiana, show a progressive substitution of Fe for octahedral Al with increasing diagenesis. An octahedral Fe content of 0.50 atoms was calculated from glauconite located in early ankeritic concretions. Octahedral Fe averaged 0.60 and 0.90 atoms in later ferroan calcite-cemented sandstone and uncemented sandstone, respectively. Corresponding octahedral Al averages were 1.16, 1.03, and 0.67, respectively. A systematic increase in average interlayer K from 0.49 to 0.54 to 0.61 was also observed, with apparent increases in diagenesis. All element determinations were made with an electron microprobe and recast on an anion equivalent basis to structural formulae based on the $O_{10}(OH)_2$ unit. The clay preserved in the early ankerite concretions was found to be an illite/smectite containing about 20% expandable layers, and the mineral in the glauconite pellets from uncemented areas of the sandstone, an ordered glauconite. “ Minus cement ” porosities of the sandstone indicate that glauconitization may have taken place at burial depths greater than 0.6 to 1.8 km, but the mechanism for the incorporation of Fe^{3+} in the glauconite at that depth is not apparent.

Key Words: Ankerite cement • Diagenesis • Glauconite • Illite/smectite • Iron • Potassium

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