Burial Diagenesis in Gulf Coast Pelitic Sediments

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Abstract: Subsurface samples of shales ranging in age from Pleistocene to Eocene obtained from five Gulf Coast oil wells were examined mineralogically and chemically to determine the nature and extent of burial diagenesis in pelitic sediments. Illite/montmorillonite dominates the mineralogy and undergoes a monotonic decrease in expandability from about 80 to a limit of 20 per cent montmorillonite layers with increasing depth. The interstratification changes from random to ordered at about 35 per cent expanded layers. Discrete illite and kaolinite phases are ubiquitous and judged detrital. The discrete illite (mica) content of the whole rock decreases with depth, while the kaolinite shows no systematic variation. Chlorite occurs in appreciable amounts in only one well and there only in samples from the shallow water facies. This chlorite is also considered detrital.

Whole rock chemical analyses show no systematic variation with depth except for a decrease in calcium and magnesium caused by solution of carbonate. In contrast, potassium increases progressively with depth in the clay-size fraction, indicating a redistribution of potassium within the rock. Detrital illite (mica) seems to break down with increasing depth, thereby supplying potassium for interlayer fixation in illite/montmorillonite as the proportion of illite layers increases. The diagenetic reaction is independent of the geologic age of the sediments and of stratigraphic boundaries. Temperature seems to be more important than pressure in governing the reaction.

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