CHANGES IN IONIC CONCENTRATION OF EFFLUENT FROM COMPACTION OF CLAY

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University of Houston M. S. thesis, 96 p . , 23 figs., August, 1965

ABSTRACT

Samples of montmorillonite from Clay Spur, Wyomingand illite from Fithian, Illinois were equilibrated with artificial sea water and experimentally compacted. A constant pressure of 800 psi was applied and successive increments of filtrate were collected and analyzed.

During equilibration of the montmorillonite slurries, magnesium was preferentially removed from the saturating solution by the clay particles. Upon compacting the montmorillonite slurries, it was found that the effluent was progressively enriched in sodium, potassium, and calcium and progressively depleted of magnesium. Within the pressure range utilized, each cation underwent total concentration changes of 1 to 2 per cent of its initial concentration.

The effluent is thought to be enriched in the three cations through increasing replacement of sodium, calcium, and potassium by magnesium on the ion exchange sites of clay particles during compaction.

Illite runs displayed no noticeable trends of enrichment or depletion during compaction. However, sodium apparently replaced calcium during equilibration.

The enrichment of effluent during compaction is a mechanism that may produce the observed salinity increases with depth in subsurface waters. Also, the preferential absorption of magnesium by clays of high cation exchange capacity should contirubte to the high calcium to magnesium ratio found in subsurface waters. This ratio i s the reverse o f that found in natural sea water, where the concentration of magnesium is approximately three times that of calcium.