The Mineralogy of Glauconite

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Abstract: The mineral in monomineralic glauconite pellets is an iron-rich mixed-layer illite-smectite (here called glauconite), often composed almost entirely of illite layers. The nature of the interlayering is closely analagous to that of aluminous illite smectite and varies with the proportions of the layer types: > 30 per cent smectite, randomly interstratified; 15 – 30 per cent smectite, allevardite-like ordering; < 15 per cent smectite, ‘IMII’ ordering.

Glauconite is analagous to aluminous illite smectite chemically as well as structurally. A good correlation has been found between the number of potassium atoms per $O_{10}(OH)_2$ in structural formulas calculated from the chemical analyses and the proportion of illite layers as determined by X-ray powder diffraction methods. This relationship indicates a remarkably systematic increase in the potassium content of the illite layers with an increasing proportion of illite layers. This feature and the existence of ordered interlayering at high proportions of illite layers can be explained by crystal-chemical effects of illite layers on neighboring smectite layers. Glauconite differs from aluminous illite-smectite in that glauconite contains significantly less potassium per illite layer than does aluminous illite-smectite with the same proportion of illite layers except near the pure illite composition. The strength with which the interlayer potassium is held and the ease of conversion of smectite to illite layers in glauconite may be attributed to its 1M structure and, perhaps, to its high octahedral iron content, which lead to stronger bonding of potassium by allowing a higher tilt angle of the O-H axis of hydroxyls adjacent to the potassium ion.

The apparent octahedral cation occupancy in excess of two-thirds of the octahedral positions in many glauconites appears largely attributable to the presence of significant amounts of interlayer hydroxy-iron, aluminum and magnesium complexes in the smectite layers.

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