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# Order of Mixed-Layering in Illite/Montmorillonites

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**Abstract:** A number of otherwise poorly understood compositional-structural relationships in mixed-layer illite/montmorillonites appear to be explained by ordered interlayering of 2:1 units. The ordering appears to be between high and low charge 2:1 units. The relationship between per cent expandable layers and mean lattice charge in natural materials shows a scatter that is nicely bracketed by hypothetical curves constructed assuming random or completely ordered interlayering for several types of 2:1 charge distribution. Natural samples with 30– 50% expandable layers plotting near the “ ordered” curves have diffraction peaks at 25 Å for two water layers in the expandable layers and 27 Å with two glycol layers; samples plotting near the “ random” curves do not have these peaks and have poorly developed 001/001 reflections.

Some tentative conclusions are: (1) illites are virtually non-expandable at lattice charges significantly less than that of ideal mica because of ordering of high-low charge 2:1 units, (2) illites and mixed-layer illite/montmorillonites with the same mean lattice charge show a range of expandability because of varying degrees of ordering, (3) the highly variable CEC of samples with the same expandability also results from a varying degree of ordering.

An interesting petrological implication results when it is realized that a sample with a given bulk composition can have a wide range of expandability, depending on ordering. Low expandability, achieved by ordering, should be promoted by formation at high pressures. Glauconites, known to form largely at the time of sedimentation, appear to be dominantly randomly interstratified; illites and illite/montmorillonites, which may form on deep burial of argillaceous sediments, are dominantly ordered.

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