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# The Release of Aluminum from Aluminosilicate Minerals. I. Kinetics

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**Abstract:** The rates of release of Al by  $M \text{NH}_4\text{NO}_3$  (pH 3) from minerals saturated with Al ions at pH 3 suggest that Al ions migrated from the surface layers and the matrix cores of kaolinite, montmorillonite, illite, and biotite, but only from the matrix core of muscovite mica. From the 0.25– 0.5  $\mu\text{m}$  kaolinite and montmorillonite, part of the ' surface' Al is released ' instantaneously' and the rest by first order kinetics, but the coarse 1.5– 2.5  $\mu\text{m}$  kaolinite has only the former component. From illite and biotite, ' surface' Al is released by ' bulk diffusion' kinetics suggesting the existence of disturbed peripheral layers of finite thickness. The diffusion coefficients,  $D_m$ , for the matrix core follow the trend: mica  $\approx$  biotite > illite > montmorillonite > kaolinite.

Based on models proposed in previous work, the ionic composition of the ' surface' Al is calculated. This shows that (1) this composition varies according to the mineral from 3 to 100%  $\text{Al}^{3+}$  the remainder being in the hydrolyzed form, and (2) the apparent hydrolysis constants are different for each mineral and significantly different from those of Al ions in solution.

**Key Words:** Aluminum • Biotite • Illite • Kaolinite • Montmorillonite

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