
Surface Charge Variation in Aging Ferric Hydroxide

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Abstract: The variation with time of exchangeable surface charge of amorphous ferric hydroxide in aqueous suspension was monitored by a titration technique. After 120 days, the surface charge of suspensions with initial pH from 8.5 to 10.5 was about one-fourth of the initial value, and goethite had formed from the ferric hydroxide. After the same time interval, the exchangeable surface charge of suspensions with initial pH from 5.5 to 8.0 was about two thirds the original value and the ferric hydroxide was still largely amorphous. The initial rate of crystallization and surface charge reduction increased with initial pH for suspensions with pH from 8.5 to 10.5, whereas the rate of surface charge reduction appeared to be independent of pH for suspensions with initial pH between 5.5 and 8.0. Based on these results it is suggested that at pH from 8.5 to 10.5 ferric hydroxide ages to goethite via a solution stage involving the $\text{Fe}(\text{OH})_4^-$ ion, whereas at pH values below 8.5 ferric hydroxide aging proceeds via mechanisms which do not involve the particle surface or bulk solution.

Clays and Clay Minerals; December 1976 v. 24; no. 6; p. 320-326; DOI: [10.1346/CCMN.1976.0240608](https://doi.org/10.1346/CCMN.1976.0240608)

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