
The Al Pillaring of Clays. Part I. Pillaring with Dilute and Concentrated Al Solutions

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Abstract: Saponite, hectorite, and laponite have been pillared with cationic Al clusters, and special attention has been given to the solution chemistry of Al. Pillared saponite is obtained after exchange with refluxed Al solutions; while for hectorite, Al solutions treated with ammonium acetate give a pillared product with 1.8– 1.9 nm spacing and thermal stability up to 873 K. In both types of solutions, the Keggin ion Al cluster is a minority species or totally absent. The typical 1.8– 1.9 nm spacing is only obtained after washing. The quality of the pillared material can be judged from its thermal stability, its surface area, and the width of the d001 line before and after pillaring. The width should not exceed 0.3 nm before calcination and 0.5 nm after calcination. The latter criterion reflects the importance of the crystallinity of the parent clay for successful pillaring. Pillaring in concentrated conditions occurs by a combination of ion exchange and precipitation of Al and gives materials that exhibit poor thermal stability.

Key Words: Aluminium • Hectorite • Laponite • Pillaring • Saponite

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