
K/Ar Systematics of an Acid-Treated Illite/Smectite: Implications for Evaluating Age and Crystal Structure

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Abstract: On the basis of progressive acid dissolution the Thompson-Hower model states that mixed-layer glauconite/smectite and illite/smectite contain potassium in two structural sites: a mica-type K position (site 1) and a position of uncertain structural status more prone to dissolution (site 2). Site 2 was thought not to retain radiogenic argon ($^{40}\text{Ar}^*$). Using extensive progressive acid dissolution and K/Ar studies on a sized illite/smectite (I/S), determining the amount of K in site 2 is shown to be somewhat more complicated than previously thought because the dissolution pattern depends on acid normality. More important, site 2 fully retains $^{40}\text{Ar}^*$, and no age correction is thus necessary as is required by the Thompson-Hower model, further affirming the geochronologic value of iUite in mixed-layer clay. These data are also relevant to understanding the crystal and particle structure of I/S. Site 2 is probably a partly filled K interlayer that develops as an intermediate kinematic step on the way to being fully filled during the transformation of smectite to illite.

Key Words: Acid dissolution • Age dating • Glauconite • Illite/smectite • Interstratification • Ordering • Potassium

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