

粘土ゾルおよびゲル中でのアゾベンゼンの光異性化

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 Photoisomerization of Azobenzene in Clay Sols and Gels (¹Department of Applied Chemistry,
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Layered clay minerals have been investigated as matrixes of functional molecules. However, clay colloids have attracted less attention, although they exhibit sol-gel transition which can affect the behavior of the functional molecules immobilized on clay particles. We report herein the photoisomerization of azobenzene in clay colloids. A cationic azobenzene, 4-butylazobenzene-4'-(oxyethyl)trimethylammonium (Az^+), and synthetic saponite clay were employed. The photoisomerization of Az^+ obeyed first-order kinetics in both of the clay colloids and an aqueous solution, while the Az^+ molecules were adsorbed on the clay particles in the colloids (except clay concentration of 25 g/L). In the clay colloids of sol state, both of trans-to-cis and cis-to-trans photoisomerizations were decelerated with increasing the clay concentration. In the colloids of gel state, however, both of the reaction rates increased with increasing the clay concentration.

Keywords : Clay colloid, Azobenzene, Photoisomerization, Sol-gel transition

層状粘土鉱物は機能分子の固定化媒体として研究されているが、粘土鉱物ナノシートのコロイドを媒体とする研究は少ない。特に粘土コロイドのゾルゲル転移と関連づけた研究はほとんどない。本研究では、粘土コロイド（合成サポナイト）中でのカチオン性アゾベンゼン（4-butylazobenzene-4'-(oxyethyl)trimethylammonium (Az^+)) の光異性化を調べた。粘土コロイド中の Az^+ は、粘土粒子に吸着していたが、粘土濃度 25 g/L の場合を除き、水溶液中と同様に 1 次反応に従う光異性化を示した。しかし反応速度は粘土の影響を受け (Figure 1)、粘土ゾル中では、粘土濃度の増大にともなって trans-to-cis、cis-to-trans の両方向とも、異反応速度は減少した。これに対して粘土ゲル中では、粘土濃度の増大にともなって、両方向の光異性化とも、反応速度が増大した。

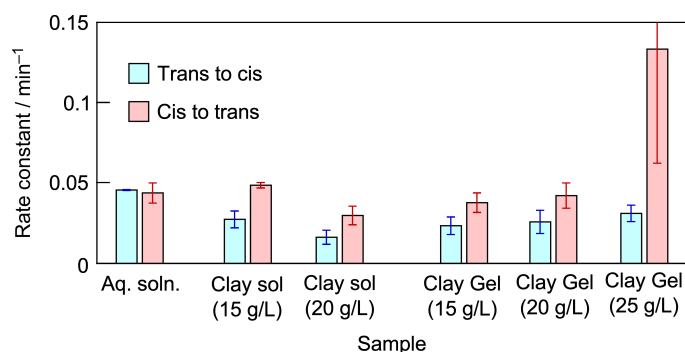


Figure 1. Rate constants of photoisomerizations of Az^+ in an aqueous solution and the clay colloids of the sol and gel state. The concentration of Az^+ is 1×10^{-5} mol/L.