

37 - 30 Selective substitution of alkali cations

in mixed alkali glass by solid-state electrochemistry

物質生命化学科	助 手	鎌 田 海
大学院自然科学研究科	前期課程	堤 優 子
		山 下 周 一
	教 授	松 本 泰 道

Electrosubstitution of alkali cations in mixed-alkali glass containing both Na₂O and K₂O for other monovalent metal cations (M⁺ = Li⁺, Ag⁺, and Cs⁺) was investigated using a solid-state electrochemical method. The fundamental electrolysis system consists of anode/M⁺-conducting microelectrode/glass/Na-beta"-Al₂O₃/cathode, where M⁺ is substituted for the alkali metal ions in the glass under an applied electric field. Li⁺ ions attacked only Na⁺ sites, and Ag⁺ ions replaced Na⁺ sites more readily than K⁺. In contrast, Cs⁺ ions simultaneously substituted for both Na⁺ and K⁺ sites. The substitution behavior appears to depend on the difference in ionic conductivity between K⁺ and Na⁺ and the radius of the dopant. This mechanism was discussed qualitatively.

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