36－58　Electrochemical design of metal distribution in alkali silicate glass with ion-conducting microelectrodes

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Electrochemical design of silver distribution near the surface or in the bulk of the alkali silicate glass for preparation of optical devices was carried out using an ion-conducting microelectrode. Fundamental solid-state electrochemical cell consists of an anode (Ag) / Ag-β"-Al_2O_3 / alkali silicate glass / cathode (Ag) system, where Ag^+ conducting Ag-β"-Al_2O_3 microelectrode was used as a cationic source. Ag^+ in the Ag-β"-Al_2O_3 was substituted for alkali metal cations in the glass during the electrolysis. Scanning Ag-β"-Al_2O_3 microelectrode under applying an electric field resulted in the fine-patterned Ag-distribution in the glass surface so that the contact radius between Ag-β"-Al_2O_3 and glass was extremely small (about 10μm). Furthermore, the patterned Ag distribution, which was constructed near the surface in advance, can be encapsulated within the bulk by the subsequent Na^+ injection.

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