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Glassy As_2Se_3:Ag Electrode as a Silver Ion Sensor

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Silver-ion-selective electrochemical sensors have been fabricated. The sensor material consisted of glassy arsenic triselenide with a silver additive ($As_{40}Se_{60}Ag_x$; $x=1.5$ and 2 at%). Bulk samples which were soaked in the test solution consisting of strong nitric acid and silver and/or copper nitrates were used as the sensor electrode. EMF (electromotive force) and DC and AC currents were measured by potentiometric and amperometric methods, respectively. These factors were found to depend on silver ion concentration in the test solution. Selectivity for silver ions in solution containing copper ions was excellent. Evaporated thin films of As_2Se_3:Ag were also investigated as the ion sensor. The EMF of the film sample was observed to be as stable as that of the bulk sample.

1. Introduction

Chalcogenide glasses are known generally not to be attacked by a number of strong acids and to be very stable in chemical composition even with the addition of metal impurities.[1] Accordingly, chalcogenide glasses can be good candidates for electrode materials as ion-selective electrochemical sensors for metal ions in strong acid and corrosive media. Chalcogenide glass electrodes have been investigated by many workers,[2-5] who employed chalcogenide glasses containing large amounts of metal. It has been pointed out that chalcogenide glass electrodes are superior in sensitivity, selectivity and electrostability to conventional crystalline sensors.

A typical example of chalcogenide glasses is arsenic triselenide (As_2Se_3). We fabricated silver ion sensor electrodes from arsenic triselenide doped with a small