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Entitled

FABRICATION, CHARACTERIZATION AND ANALYTICAL APPLICATIONS OF PLANAR SOLID METAL AND PLANAR CAVITY ELECTRODES

by

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Abstract

The present Thesis describes the design, construction, and applications of a versatile flow cell (VFC) for used with different types of planar working electrodes. These included the commercially available planar 3-electrode screen-printed electrode chips (SPECs), custom planar metallic electrodes (PMEs), and cavity-type electrodes (CTEs). The PMEs are fabricated from platinum, titanium, stainless steel and copper rods inserted in a rectangular-PEEK housing, respectively. The dimensions of the PEEK blocks were 13.5 mm width × 39 mm length × 12.5 mm height. The VFC was constructed from a cell cover and base machined from acrylic sheets. The cover incorporated a built-in Ag/AgCl/Cl^- true reference electrode (RE) and a gold-coated stainless-steel counter electrode (CE). The cell base was designed to accommodate directly any of the PMEs rectangular blocks (13.5 mm width × 39 mm length × 12.5 mm height). A small acrylic rectangular adaptor of the same dimensions with a groove (13.5 mm width × 39 mm length × 12.5 mm height width was used to install the SPEC on the top surface of the cell base. The built-in RE and CE not only offered the option to use a true electrolyte-based RE instead of the screen-printed ones, but allowed also the possibility of using the screen-printed counter electrode as a second working electrode (i.e., dual working electrode configuration). Moreover, they allowed the same cell to be used with conventional single working electrode of the PMEs or CTEs type. The applications of the VFC in the amperometric and potentiometric flow-injection analysis application and the associated advantages are also presented.

Keywords: Flow Cells; Screen Printed Electrodes; Metallic Electrodes, Paste Electrodes; Amperometric Detection; Potentiometric Detection.