INVESTIGATIONS ON REDOX FLOW CELLS AND PHOTOGALVANIC CELLS

BY

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TO RAVI

CERTIFICATE

This is to certify that thesis entitled **"INVESTIGATIONS ON REDOX FLOW CELLS AND PHOTOGALVANIC CELLS"** being submitted by Mrs. Tanuja Ravindra Kumar for the award of the degree of "Doctor of Philosophy" in Chemistry is a record of bonafide research work carried out by her. Mrs. Tanuja R. Kumar has worked under our guidance and supervision and has fulfilled the requirements for submission of the thesis, which to our knowledge, has reached the requisite standard.

The results contained in this thesis have not been submitted, in part or in full, to any other University or Institute for the award of any degree.

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ABSTRACT

The thesis has been divided into three parts.

The first part of the thesis deals with the investigations on redox flow cells. Various complexes of iron viz. Fe-ethylenediamine-tetraacetic acid, Fe-diethylenetriamine-pentaacetic acid and Fe-nitrilotriacetic acid have been identified as potential redox couples for their use in positive half of an all iron redox cell. Performance characteristics of two all-iron redox cells consisting of iron-EDTA complex and/or iron-DTPA complex as the positive half cell and iron-phenanthroline complex as the negative half cell have been investigated. It has been found that the performance of the cell is constrained due to high overvoltages in both the half cells.

The second part of the thesis reports the results on photogalvanic (PG) cells. Cyclic voltammetric studies have been carried out in order to determine the kinetics of reaction between reduced dyes (thionine, methylene blue and new methylene blue) and Fe^{3+}. For improving the performance of the new methylene blue (NMB) based photogalvanic cell, NMB coated platinum electrode was prepared. The NMB modified platinum electrode was characterized by cyclic voltammetric and spectroscopic technique. It has been observed that the NMB modified electrode improves the performance of the PG cell containing NMB and Fe^{3+}.

Results on photogalvanic effect arising out of chlorophyll and chloroplast coated electrodes in solution containing substituted quinones and a ferrocene derivative is reported in the last part of the thesis. Chlorophyll and chloroplast coated pyrolytic graphite (basal plane) electrodes have been found to be negative with respect to quinones and positive with respect to a substituted ferrocene.

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