CHAPTER - VIII

SUMMARY AND SCOPE FOR FUTURE RESEARCH
CHAPTER VIII
SUMMARY AND SCOPE FOR FUTURE RESEARCH

8.1 SUMMARY

- Analytical expression of current in rapid photolytic processes at a planar electrode is derived. The derivation is given for a planar electrode. An excellent agreement with the previous analytical results is noted.

- A critical evaluation of the influence of geometry on the behavior of the transient current at all ultramicroelectrodes is presented. The non-steady state chronoamperometric diffusion limited current of various microelectrodes (circular disc, circular ring, elliptical disc, elliptical ring, band, hemicylinder, hemisphere, hemi oblate and hemi prolate electrodes) are compared.

- The steady state and non-steady state diffusion-limited currents for EC reactions for all ultramicroelectrodes (circular disc, circular ring, elliptical disc, elliptical ring, band, hemisphere, hemicylinder, hemi-oblate and hemi-prolate electrodes) are compared. A critical assessment of the influence of geometry on the behavior of the transient current is reported.

- Analytical solution of non-steady state chronoamperometric current at ultramicroband electrode is derived. The analytical expression for current (Padé approximant), valid for entire time domain is compared with the analytical and digital simulation data. A satisfactory agreement with the available limiting cases of analytical expressions and digital simulation data is noted.

- A simple analytical approach to find the traveling-wave solutions for a set of two coupled non-linear reaction diffusion equations is reported. An exact analytical solution for traveling-waves of the Fisher equations with a general non-linearity is found. The boundary value, the boundedness and the stability of the solution are discussed.
The theoretical analysis of the steady-state amperometric response for conducting polymer-modified ultramicroelectrodes is discussed. The effect of substrate diffusion in the solution adjacent to the polymer film on both the concentration profile and current response is also examined. The simple analytical expressions for substrate and mediator concentrations and current responses for all values of reaction diffusion parameters are presented.

8.2 SCOPE FOR FUTURE RESEARCH WORK

The present investigation offers scope for future research on the following lines.

1. The approach employed here to evaluate the chronoamperometric transient current from potential steps at all ultramicroelectrodes can also be extended to cyclic voltammetric and coupled Homogeneous kinetics response of arbitrary complex reaction mechanisms.

2. The theory of scanning electrochemical microscope (SFCM) response for a disc shaped tip is also a topic of current investigations. The methods to simulate current at all ultramicroelectrodes can also be employed in obtaining current pertaining to scanning electrochemical microscopy.

3. The methodology proposed here can also be extended to a theoretical model for reaction and diffusion within an electroactive polymer film deposited via electropolymerization onto an embedded microdisc surface. This model will take into account the fact that the polymer film may exhibit spillover: in such a circumstance the layer will extend onto and cover part of the insulating sheath surface which surrounds and is flush with the embedded microdisc.