P_R_E_F_A_C_E

The main sources of energy at present are fossil fuels which are likely to be exhausted. There will be then energy crisis unless atomic energy is easily available. At the present stage the conversion of atomic energy into useful form requires materials which are scarcely distributed in the earth. It also requires high degree of technological skill. Moreover, the process involves many hazards including pollution of the environment. The other alternative is utilisation of abundant solar energy converting it into useful forms.

In the natural process solar energy is being utilised in our life cycle through plants, animals and their decay products. The heat energy in the sunrays has already being utilised in other form. Researches are now being carried out to utilise the energy of visible and ultraviolet region of sunrays converting it into electrical energy directly producing a very efficient fuel, namely hydrogen by splitting water. In these processes the basic materials used are suitable semiconducting substances and the basic principle adopted is the photovoltaic effect.

The photovoltaic effect is exhibited by p-n homojunction, p-n heterojunction Schottky barrier and semiconductor-liquid junction. In the solid state device p-n homojunction has already been utilised with limited scope at present to convert solar energy into electrical energy. Recently, there has been much interest in the

field of research with semiconductor-liquid junction. The photoelectrochemical (PEC) cell based on semiconductor-liquid junction electrode can be used to convert solar energy to electrical energy or chemical energy in the form of useful products.

The semiconducting substances that are used in semiconductor-liquid junction based PEC cells are either as single crystals or polycrystalline form.

The present thesis describes the results of our investigation on the photoelectrochemical behaviour of some compound polycrystalline semiconductor electrodes in liquid-junction PEC cells.

The thesis has been presented in four chapters. The first chapter is a general introduction of the area of investigation including both theoretical and experimental parts. The chapter begins with a brief review of the present area of work and describes the basic concepts and principles underlying the photoelectrochemical systems.

Chapter-II deals with the photoelectrochemical studies of polycrystalline electrodeposited and pressure-sintered Bi_2S_3, mixed Bi_2S_3-PbS and Bi_2S_3-Ag_2S semiconductor electrodes.

Chapter-III deals with the studies on the photoelectrochemical behaviour of polycrystalline electrodeposited and pressure-sintered CdS, mixed CdS-PbS and CdS-CdSe semiconductor electrodes.

Chapter-IV describes the photoelectrochemical behaviour of thin film ZnSe and Sb_2Se_3 semiconductor electrodes.