PHOTOPHYSICS 87

K. Tennakone

In the year 1987 Photophysics programme has touched almost all currently fashionable topics related to solar energy conversion. A significant progress was made in the following areas.

Photocleavage of Water

The work started in 1987 on two step photodecomposition of water was extended. Several new semiconductor materials (hydrous ferric oxide, cupric ferrocyanide, silver phosphate, cuprus chloride) having highly negative flat-band potentials were defected. It was demonstrated for the first time that there exists semiconductor catalysts capable of photogenerating hydrogen without the necessity of having electron and/or hole transfer catalysts.

Photofixation of Nitrogen

The hydrous ferric oxide system for photoreduction of nitrogen was studied in detail. Ammonia, oxygen and peroxide yields were estimated accurately. Hydrous ferric oxide deposited on clay or doped with hydrous titanium oxide was found to improve the performance of the catalyst. Attempts were made to elucidate the mechanism of catalysis and reaction kinetics.

Photoelectrochemical Cells

The quantum efficiencies of hetrojunction photoelectrochemical cells based on CdS, CuS and CuCNS were measured. It was observed that in thin film hetrojunction PECs new types of more efficient charge transfer processes are involved. The variation of the quantum efficiency of dye-sensitized PECs with the surface

concentration of the dye was determined. A charge separation process via exciton formation was suggested to explain the anomalies at higher surface concentrations. The influence of doping on the type of conductivity (n or p) of CuCNS was investigated and their photoelectrochemical properties determined.

Solid State Photovoltaic Cells

A dye-sensitized solid state solar cell was constructed to study the sensitization phenomena at the absence of a electrolyte. Quantum efficiencies were measured and compared with sensitized liquid junction cells. Photovoltaic cells based on p-CuCNS and n-CuCNS were studeid.

Biomass Conversion

The work started in 1987 on biomass conversion was continued. Experiments were conducted to test the mathematical models. The optimum energy harvest efficiency of lemna and salvania were measured.

Organic Photochemistry

It is well known that rosaniline type dyes undergo bleaching when treated with sulphur dioxide. We have noted that bleached solution (Shiff's Reagent) exhibits photochromism. Experiments were carried out to examine the phenomenon and reaction mechanisms were determined.