

ABSTRACT

In this work stability of photocurrent of two photoelectrochemical cells (PECs) and photocatalytic activity for photocleavage of water in few aqueous semiconductor suspensions are investigated.

It is found that a thin layer of p-CuCNS suppress photocorrosion of Cu_2O photocathode in aqueous thiocyanate. In the other PEC, highly stable photocurrent was achieved by deposition of two dyes on the CuCNS substrate. When CuCNS is coated with a dye that can transfer a charge carrier upon excitation into an energy band if a layer of a second dye that can readily transfer the energy of photon excitations into the inner one by resonance is deposited on top of the first dye, then photodegradation of both dyes are suppressed.

Three aqueous photocatalytic systems based on $\text{Ag}_2\text{O}/\text{Ag}$, $\text{CuCl}_2/\text{CuCl}$ and $\text{Hg}_2\text{O}/\text{Hg}$ redox couples are found to photo-oxidise water into oxygen and hydrogen by a cyclic two photosystem process in the presence of sensitizer (eg. TiO_2). In each system, the redox couples act as the electron pool linking the two photosystems.

β - form p-CuCNS was found to photo-oxidise water in the presence of sacrificial agents more readily than most materials generally used for this purpose. When p-CuCNS coated with dye and then platinized, photogenerates oxygen with the dye remaining photostable. Again a suspension of Hg_2Cl_2 in aqueous HgCl_2 photogenerates oxygen reducing HgCl_2 to Hg_2Cl_2 . In absence of an electron acceptor Hg_2Cl_2 photogenerate oxygen from water degrading into Hg. A number of heavy metal hexacyanides are also tested for their

ability to catalyse photo-oxidation of water with $\text{bipy}_3\text{Ru}^{2+}$ as the sensitizer and $\text{K}_2\text{S}_2\text{O}_8$ as the electron donor. Strongest catalytic activity is seen in $\text{Zn}_3(\text{Fe}(\text{CN})_6)_2$ and $\text{Cd}_3(\text{Fe}(\text{CN})_6)_2$.