

ABSTRACT

The aim of this study is to search for novel semiconductor materials for photoelectrochemical cells and photocatalytic devices. The diffuse reflectance measurements, flat band potential measurements, photocurrent behaviour and conductivity properties were used to identify and characterize these materials.

It was found that cuprous thiocyanate shows relatively high photostability and possibility of sensitization with visible light. Another advantage of this material is that thin layers can be deposited on copper surface. The thin layer of p-CuCNS suppresses photocorrosion of the Cu_2O photocathode in aqueous thiocyanate. The Catalytic properties of CuCNS was also studied. The β -form of p-CuCNS was found to photooxidize water in the presence of sacrificial agents.

In addition, colloidal suspensions, surface modified catalysts and composite catalysts were tested for their photocatalytic activity in nitrogen fixation.

Among them, the following systems showed relatively high activity. (1) Pt, Ag, Hg coated SrTiO_3 , (2) Hydrated ferric oxide, (3) Composite catalyst of Ti(IV) exchanged ferric oxide, (4) Hydrous cuprous oxide and (5) Cuprous chloride coated hydrous cuprous oxide. The high activity of these materials is due to good charge separation, strong negative flat band potentials and chemisorption of N_2 .