



Colloquium Speaker

Thursday, March 20, 2008, 4 pm, CF 105

Refreshments 3:30 pm - Physics/Astron Conference Rm CF 386

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Solar Light Applications for Hydrogen Production from Water

Hydrogen production from water via semiconductor photoelectrochemistry or semiconductor photocatalysts is a topic of great interest in light of current concerns about energy resources. A diverse array of metal oxides, mixed-metal oxides, metal chalcogenides, and doped metal oxides are reported to have the ability to promote the photo-splitting of water either electrochemically, photochemically or photoelectrochemically. Electrochemical water splitting powered either by photovoltaic arrays or direct light irradiation produces molecular hydrogen at the cathode, while organic compound oxidation under mild conditions takes place at the anode in competition with the production of oxygen. An electrolytic cell, which is based on the coupling of semiconductor anodes with stainless steel cathodes, is characterized in terms of hydrogen production efficiency and organic compound degradation. In the solar-powered photovoltaic-electrochemical system, the production of molecular oxygen at the anode is suppressed by the simultaneous oxidation and mineralization of organic compounds dissolved in water. In addition, the anodic oxidation of organic substrates has a synergistic effect on hydrogen production at the cathode that results in substantial increases in the energy efficiency for H₂ generation at circum-neutral pH in the presence of dilute electrolyte solutions.