Renewable Energy from a Neglected Photovoltaic Material: Boron Arsenide

Allen J. Bard, Alan Cowley, Department of Chemistry and Biochemistry, University of Texas at Austin, Austin, TX 78712

A p-type boron arsenide photoelectrode was prepared from a material consisting of a thin layer of boron arsenide on a boron substrate. The electrode was found to be photoactive under both visible and UV-visible light irradiation and displayed a photocurrent of approximately 0.1 mA/cm$^2$ under UV-visible light irradiation at an applied potential of -0.25 V vs. Ag/AgCl. Mott-Schottky plots were obtained for this boron arsenide electrode and displayed an estimated flat-band potential near the onset photopotential. The estimated indirect band gap, as determined from incident photon-to-electron conversion efficiency plots, is 1.46±0.02 eV.

SEM images reveal the surface and core structure of the boron arsenide containing material prepared from granular boron

IPCE from the BAs crystal calculated from the net photocurrent in a 0.1 M Na$_2$SO$_4$ containing 0.01 M methyl viologen at -0.25 V vs. Ag/AgCl.