E1-45: Nano-porous n-TiO_2 /selenium /p-CuCNS photovoltaic cell

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Nano-porous films of high band gap semiconductors could be photosensitized either by pigment or dye attached to it or by low band gap semiconductor deposited on its surface. In this work we discuss fabrication of a photovoltaic cell by sensitizing nano-porous film of TiO_2 with thin film of selenium. This cell generates a photocurrent of ~3.0 mA/cm^2 and photovoltage of ~ 600 mV at 800 W/m^2 simulated sunlight.

Nano-porous film of TiO_2, was prepared by spreading colloidal TiO_2, containing acetic acid on a conducting tin oxide (CTO) glass plate, placed on a hot plate and sintering at 450°C. A thin film of selenium was electrolytically deposited on nano-porous film of TiO_2, from aqueous solution of SeO_2. The plate was heated at 150°C for 5 min to transfer red Se into the gray form. CuCNS powder was dissolved in acetonitrile containing trace of HCl and this solution was sprayed onto the Se coated surface. The electrical contacts were made by pressing the CuCNS layer onto a graphite-coated CTO glass.

The location of the bands of n-TiO_2, selenium and p-CuCNS facilitate the efficient separation of photogenerated electrons and holes in thin film of Se into n-TiO_2 and p-CuCNS respectively. The I-V characteristic of the cell deviated drastically from the squareness due to short circuiting across the voids on the porous film of TiO_2 reducing the efficiency of the cell to ~ 0.13%. The I-V characteristic of the cell in the dark under external biasing shows poor rectification due to the same reason. An enhanced photocurrent could be observed for Se coated on TiO_2 nano crystallites than Se coated on bare CTO glass when plates were immersed in Na_2SO_4 solution. This indicates that nano-porous structure is essential for efficient acceptance of photogenerated electrons from the selenium.

E1-46: AC magnetic susceptibility measurements on $Bi_{1.6}Pb_{0.4}Sr_2Ca_2Cu_3O_y$

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In this work, AC magnetic susceptibility measurements $\chi(T)$ on $Bi_{1.6}Pb_{0.4}Sr_2Ca_2Cu_3O_y$ superconducting sample were carried out in both zero and DC magnetic fields in the temperature range from 4.2K to 130K. AC Hartshorn bridge was used to measure AC susceptibility of the sample. Gold-iron/ chromel thermocouple was used to measure the temperature of the sample.

From $\chi(T)$ data in zero magnetic field, the onset superconducting transition temperature of the sample was found to be 107.5K. A single drop in the data suggests that the sample has only one superconducting phase. However, a small kink is observed in the $\chi(T)$ data at a temperature of 105.6K due to the weak-link couplings between the superconducting grains. When the magnetic fields were applied to the sample the superconducting transitions of the sample became broad as the magnetic fields suppressed superconductivity. $\chi(T)$data in low magnetic fields show 2 drops which are attributed to the intergrain and intragrain regions of the sample. In high magnetic field $\chi(T)$data shows only one drop suggesting that the magnetic field simultaneously penetrates into the superconducting grains and the weak-links.

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E1-47: Solar energy conversion using solid state photoelectrochemical solar cells based on solid polymer electrolyte, polyethylene oxide

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Photoelectrochemical (PEC) solar cells provide a convenient and inexpensive method of converting solar energy into electricity. Conventional PEC cells are made by dipping a photoactive cathode made of a semiconductor into an electrolyte solution. However, there are several drawbacks in these conventional PEC cells. Photocorrosion of the electrodes and side reactions limit the working life time of these cells. They are difficult to pack.