E1-01 A Nano-porous solid-state photovoltaic cell sensitized with Delphinidin

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An NDP device, n-type semiconductor/dye/p-type semiconductor device, was fabricated by depositing p-CuI onto the pigment delphinidin adsorbed on nano-porous n-TiO_2 film. The plates were coated with pigment by warming them in a 25% acetic acid solution of the pigment. CuI was deposited on the dye-coated porous surface by dip and spray coating from a solution of CuI in acetonitrile. Electrical contact was made by pressing a gold coated CTO glass onto the CuI surface.

In this NDP cell, a dye molecule excited from the ground level to excited level injects an electron into the conduction band of TiO_2. The unoccupied ground level is filled by transfer of an electron from the valence band of CuI. The NDP cell, n-TiO_2/delphinidin/p-CuI, generates a short-circuit photocurrent of 3.5mA/cm^2 and an open-circuit voltage of 450 mV (800 W/m^2 simulated sunlight). The photocurrent decay due to dye degradation is almost completely suppressed in the absence of oxygen moisture and uv-light. Using other high-band gap p-materials that yield transparent films in low-temperature depositing techniques (such as CuCNS) the photocurrent decay due to deterioration of CuI film may be overcome.