Multi-layered Phytopigments: Promising Alternative Materials for Solar Cell Development

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Semiconductor solar cells are used to harness solar energy, a clean renewable energy source for solving global pollution and energy crisis. These photovoltaic-cells are expensive and non-eco-friendly. Development of a bio-pigment solar cell with improved efficiency is the goal of this project which would provide an eco-friendly approach to solve energy crisis. The present project aims to use chlorophylls, carotenes and anthocyanin to develop multi-layered solar cells, which, because of different absorption ranges of the different bio-pigments, would trap a wide range of the solar spectrum. Chlorophyll and carotenes were isolated from spinach and Polyalthia longifolia leaves using acetone-hexane solvents and purified by chromatographic techniques. Pigment thin films were prepared by spin coating. Photoconductivity of the films was tested using a current-voltage conduction meter. A 10% increase in conductivity of the thin film made from a mixture of different phyto pigments was observed upon exposure to light. A voltage output of 0.06 V was produced from a 1.5cm x 1.5cm film exposed to light. Multi-layered bio-pigment solar cells were fabricated by electroplating micro-crystals of the purified phyto-pigments. Furthermore, dye-sensitized solar cells were also prepared using these phyto-pigments. Significant increase in absorption efficiency observed in these cells reflect multilayered phyto-pigments to be a promising alternative for developing solar cells.

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