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Conductive and transparent bacterial cellulose/silver nanowire films for application in photovoltaic devices

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Transparent conducting substrates are critical components in the fabrication of photovoltaic devices. These substrates should possess high transparency for maximum light absorption and high conductivity to minimize ohmic loss. This study explores the use of bacterial nano-cellulose incorporated with silver nanowires (AgNWs) for the fabrication of flexible films to replace conventional transparent and conductive substrates in photovoltaic devices. The AgNWs are formed via a typical nucleation process using the polyol method. The synthesized nanowires were characterized using IR, EDX, SEM, TEM and XRD spectroscopy which confirmed nanowire formation. Bacterial Cellulose (BC) was grown in a modified Hestrin and Schramm medium together with a preformed Symbiotic Culture of Bacteria and Yeast (SCOBY). Structurally, cellulose is a polymer made of repeating cellobiose units and is recognized for its superior tensile strength compared to plant based cellulose. Bacterial cellulose grows as layered sheets of cellulose and once formed, the BC was pressed and dried into thin flexible sheets. The compression of these layers is expected to produce a film of sufficient mechanical durability to withstand photovoltaic applications. Spin coating AgNWs onto the surface of the pressed BC films will render the surface conductive. It is anticipated that the AgNWs spin coated onto the surface of the BC films will serve as appropriate and flexible replacements for indium/fluoride doped tin oxide coated glass substrates in solar cells.

Biography

Denisha Gounden has completed her MSc from the University of KwaZulu-Natal (UKZN), South Africa. She is currently pursuing her PhD from UKZN, focusing on material science for solar cell applications.

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