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Eco-friendly nanomaterials for flexible sensors, optoelectronics and solar energy harvesting

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As a non-toxic and biodegradable material, cellulose nanocrystals (CNCs) are environmentally friendly. They are directly extracted from natural resources such as wood and other fiber supplies available in plants. As a high molecular weight linear polymer formed of monomers linked together by glycosidic oxygen bridges, they offer desirable bulk and nanoscale properties (e.g. high tensile strength, high surface area for interaction with surrounding species) that make them suited for use as substrates in electronic and optoelectronic devices. In this talk, I will show the fabrication and characterization of strain sensors and luminescent solar concentrators employing water-soluble CNC substrates for recycable devices. Polydimethylsiloxane (PDMS) is a common polymer for adhesive, fabric finishing agents, micro-/nanofluidics etc. and is especially used in flexible and stretchable electronics for its excellent properties of high transparency, gas permeability, good electric insulation, low surface free energy, excellent weather resistance and low toxicity. Here we show that filling CNC into PDMS can greatly improve its mechanical properties and we demonstrated a pressure/strain sensor with fast reponse to detect both diastolic and systolic pressures in the radial arterial blood pressure. Novel optical diffusers with various CNC/PDMS ratios are employed to enhance the performance of solar cells and OLED devices.

Biography

Xihua Wang is an Associate Professor of Electrical and Computer Engineering at the University of Alberta and a registered professional engineer (P.Eng.) in Alberta, Canada. His current research is centered in the general areas of solid-state electronics and photonics with particular attention to apply nanomaterials and micro-/nanofabrication for next-generation electronic, photonic and optoelectronic devices.

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