ZnO/Cellulose nanocomposite: Recent Developments and Future Prospects

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**Abstract**. Bio-composites are the best example of biodegradable, eco-friendly material. It is the amalgamation of two materials having different chemical and physical properties. We built composite materials to make it stronger, lighter in weight, and electricity resistant (Hyun et al, 2014). Cellulose is composite materials of hundred’s or sometimes even thousands of Hydrogen, Oxygen, and Carbon. It is a polymer material, which is totally eco-friendly, biodegradable, in sufficient amount to use, and bio-suitable polymer (H. Helmiyati et al, 2018). Cellulose based biocomposite materials are highly in demand because of their good antibacterial activities along with their high mechanical strength, thermal stability and flexibility properties (H. Helmiyati et al, 2018). In most research papers ZnO/Cellulose is used as a UV related applications like it is used in cosmetic product acting as a protector and in Antimicrobial activities like food packaging, fungal treatment etc. In this review paper, ZnO/Cellulose bio-composites have been chosen to discuss in details as ZnO is an n-type nontoxic semiconductor with a band gap of 3.3 eV, hence it is more preferable over other semiconductor materials for preparing semiconductor-cellulose biocomposite material (Si-Wei Zhao et al, 2017). Also Cellulose possesses 20% more current than pure ZnO (Seongcheol M et al, 2017). In recent time, ZnO-Cellulose bio composites have attracted great research attention for optical (UV sensing, shielding etc.) bioelectronics (antibacterial, drug uses etc.), mechanical (toughness etc.), electric (di-electric etc.) and thermal applications due to their combined eco-friendly and biodegradability nature. In this paper, we have extensively included the literatures reported till date on the preparation and characterization of ZnO-Cellulose bio composites. These nanocomposites are combined together using different blending methods like mechanical, solution or electro spinning. However, solution based methods including sol-gel, hydrothermal and solution casting methods are more preferred for preparation of cellulose-ZnO nanocomposites. Here, ZnO is prepared separately by using suitable Zinc and Oxygen precursors before making composites with cellulose. The preferable applications of the as-prepared bio composites are also discussed in details to find out the future scope of this biocomposite for practical applications. ZnO/Cellulose together is helpful for variety of applications like bio-electronic antibacterial, mechanical, optical, bioelectronics etc.

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