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Bionanocomposites from lignocellulosic resources: properties, applications and future trends for their use in the biomedical field

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Abstract:

The selection, synthesis, modification and shaping of biomaterials are complex tasks within the biomedical field. Human and plant tissues, such as, wood, bone and cartilage are structured at the nanometer level and exhibit a hierarchical structure up to the macroscale. Their morphological similarities enable the exploitation of lignocellulosic materials in the development of nanostructured composites targeting tissue engineering and regeneration. In this review, lignocellulosic materials and their chemical constituents are highlighted as promising alternatives for the development of drug-delivery vehicles and for the engineering or regeneration of bone and cartilage. Special focus is given to the recent developments of lignocellulosic bionanocomposite supports that induce cell attachment and proliferation. Chemical modifications techniques as well as composite processing methodologies that enhance the biomaterial performance are reviewed. It is anticipated the increasing interest in nanocellulose, bacterial cellulose, hemicellulose and lignin from natural resources as added-value biomedical materials in the near future.

Keywords: Nanocomposite; Cellulose; Scaffold; Tissue Engineering; Lignocellulosic;

Biomedical; Nanofiber; Health; Materials Science

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