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Biohybrid nanocomposites based on regenerated bacterial cellulose and Porto Santo biogenic clay: Application in drug delivery

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Abstract

The use of drugs *per si* may lead to fluctuations where whose drugs in the organism may reach levels lower than the minimum effective concentration or exceed the maximum toxic concentration, resulting in undesirable side effects, or the lack of therapeutic benefits intended for the patient. The specific structure of clay has the ability to interact with drugs and release then, which can provide an efficient drug delivery system. The clay incorporation in the bio polymeric matrixes, like bacterial cellulose offer several advantages for the use in the design of new and efficient pharmacological systems. In these systems, the drug is typically entrapped in the clay and protected by the biopolymer matrix, and both components contribute to a gradual release of the drug. This new family of composite materials frequently exhibits remarkable improvements on the material properties when compared with the matrix polymers alone or conventional micro- and macrocomposites, namely the biocompatibility and biodegradability, which makes them suitable for healthcare applications. These biohybrids nanocomposites have attracted great attention worldwide from both academic and industrial points of view. The goal of this study was the development of a biohybrid nanocomposite made with regenerated bacterial cellulose and clay for the incorporation and delivery of drugs. The clay used was the biogenic clays from Porto Santo Island, Madeira archipelago, known by the medicinal proprieties and are used in dermopharmacy and dermocosmetics. A novel nanocomposite was successfully synthesized, verifying that 40% is the optimum clay concentration to be incorporated in the nanocellulosic matrix. The incorporation of a drug model (sodium sulfacetamide) at different concentrations, show that the optimum drug concentration is 1%. The temporal release of the drug was tested and was verified that the total drug release occurs in the first 10 minutes. The obtained results expand the possible applications of the regenerated bacterial cellulose and the Porto Santo clay to the pharmacologic field.

Biography

Ricardo Gomes has completed his bachelor's degree in 2020 in University of Madeira, Portugal. At the moment, he is a master's degree student in the field of applied biochemistry. He has the financial support to do this work from Foundation for Science and Technology (UIDB/04423/2020 + UIDP/04423/2020) and by the European Territorial Cooperation Programme PCT-MAC 2014-2020 (MAC/1.1.B/269).

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