Electrical conductive bionanocomposites of chitosan and reduced graphene oxide for food packaging applications

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Currently, food processing by pulsed electric field (PEF) is one of the most promising non-thermal processing technologies available(1). The main limitation of this technology is the need for continuous flow chambers where food processing occurs prior to packaging, which is preventing its transition from the laboratory to an industrial scale(2). The present work intends to provide a solution to this need by the development of an electrical conductive membrane capable of PEF in-pack processing. In order to that, we developed a bionanocomposite that joins the antioxidant(3) and antimicrobial properties(4) of chitosan with the electrical conductivity of reduced graphene oxide. Graphene oxide was synthesized by an improved Hummers method(5) and was further hydrothermally reduced in the presence of caffeic acid. This green methodology is capable of an efficient reduction, proved by the electrical conductivity of reduced graphene oxide while at the same time favours its homogenization into the chitosan matrix, due to the presence of caffeic acid. The bionanocomposites were prepared by the incorporation and homogenization of reduced graphene oxide into the chitosan matrix and dried by solvent casting. The resultant membranes showed good mechanical properties and good electrical conductivity, variable according to the reduced graphene oxide concentration. Due to intrinsic biological properties of chitosan and the electrical conductivity of reduced graphene oxide, these bionanocomposites are promising for active food packaging to process food in-packby PEF.

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