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FACULDADE DE CIÊNCIAS E TECNOLOGIA
UNIVERSIDADE NOVA DE LISBOA

Department of Chemistry

Novel Synthetic Polymers

Sustainable Organic Chemistry Group / REQUIMTE / Department of Chemistry / FCT / UNL

requimte
rede de química e tecnologia

C.Q.F.B.
Centro de Química Fina e Biotecnologia

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Objectives

The fundamental aim of our work is to produce novel biodegradable polymers with industrial applications (Fig.1). They will be obtained from renewable and sustainable materials (Fig.2) that should make them biocompatible and biodegradable (Fig.3), which is very important for industrial high-value-added applications with respect to environmental considerations.

Biodegradability and biocompatibility are key functional requirements in the design of new polymeric materials. We have synthesized hydrophilic and amphiphilic sugars-containing polymers and hydrogels, capable to self-organize into polymeric nanoparticles, which can find applications as drug-delivery systems (Fig.4-6).

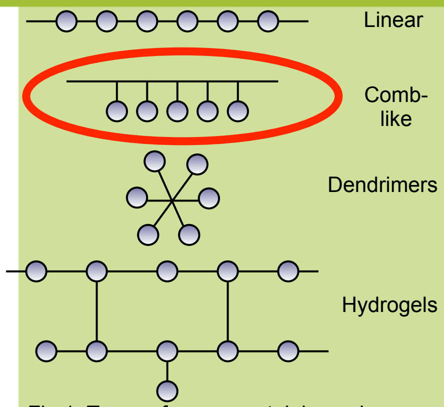

Fig.1. Types of sugar containing polymers

Methodology

To achieve the synthesis of new polymeric materials based on carbohydrates, first we needed to develop the selective synthesis of sugars-derived monomers. By the polymerization and copolymerization of unsaturated sugar compounds we have obtained the desired biodegradable and amphiphilic polymer materials.

In this context, in the last few years one of our team's objectives has been to construct new biocompatible and biodegradable polymer and copolymer architectures with industrial application, based on renewable resources and using green chemical approaches to organic chemistry, such as application of microwave irradiation and solventless procedures.

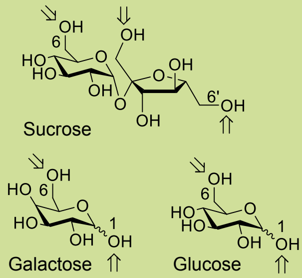

Fig.2. Structures of sugars

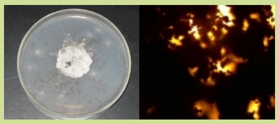

Fig.3. Biodegradation studies fungal growth >60 %

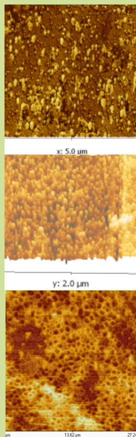

Fig.4. AFM images

Expected Results

Preparation and Characterization of Polymeric Nanoparticles Composed of Poly(DL-lactide-co-glycolide) and Poly(DL-lactide-co-glycolide)-co-poly(ethylene glycol) 10%Triblock end-capped with a galactose moiety. *React. Funct. Polym.* **2012**, *72(10)*, 729 – 735.

Sucrose chemistry: Fast and Efficient Microwave-Assisted Protocols for the Generation of Sucrose-Containing Monomer Libraries. in *Microwave Heating*, Chapter 14, Ed. Usha Chandra, InTech - Open Access Publisher, Rijeka, **2011**, p. 309-332.

Library of Mild and Economic Protocols for the Selective Derivatization of Sucrose under Microwave Irradiation. *Green Chem.* **2011**, *13 (7),* 1897 – 1906.

Synthesis and biodegradation studies of new copolymers based on sucrose derivatives and styrene. *Eur. Polym J.* **2010,** *46*, 1151-1157.

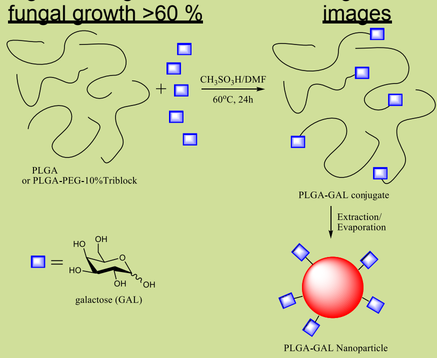

Fig.5. Synthesis of Galactose-PLGA nanoparticles

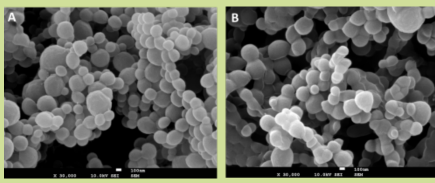

Fig.6. SEM images

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