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Novel sol-gel preparation of binary $(TiO_2)_{(x)}$-$(P_2O_5)_{(100-X)}$ nanospheres via electrospraying for biomedical application (x=40, 45, 50)

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A new sol-gel preparation method has been followed for making binary titanophosphate nanosphere glasses (NSGs) at low temperature. Binary glasses were prepared using triethyl or n-butyl phosphate and spayed via a high electric field to obtain NSGs. The structure of the NSGs was probed using X-Ray diffraction (XRD), ^{31}P nuclear magnetic resonance (^{31}P-NMR), Fourier transform infrared spectroscopy (FTIR). The elemental proportion has been characterized using energy dispersive x-ray spectroscopy (EDX) and the particle size of the spheres were measured via scanning electron microscopy (SEM). The XRD results confirmed the amorphous nature of the NSGs. The ^{31}P-NMR and FTIR spectra demonstrated that the glass structure consists of mainly Q^1 and Q^2 species. The EDX results showed higher loss of phosphorus for the samples madewith triethyl phosphate compare to n-butyl phosphate as a phosphorous precursor and SEM images confirmed the sub-micron particle size range of 100-200 nm. These results provide several interesting insight indicates the suitability of these sol-gel glasses for biomedical application, specifically to incorporate proactive molecules into these glasses for drug delivery application, since these glasses can be synthesised at low temperature. And also they can be considered as an antimicrobial and coating for biomedical devices whenever a medical device comes into direct contact with living tissue or body fluid.

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Thermal properties of starch/gelatin disposable utensils reinforced with coconut fibers

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The demands for novel biodegradable polymers for food packaging applications are supported by the increasing concern about environmental pollution as generated by the waste of plastic used on bio stable polymeric materials. Starch is found in abundance and at low cost in the Brazilian domestic market. Gelatin is a protein which confers an increase in the mechanical properties of starch-based materials. On the other hand, the industry takes only 15% coconut fruit, while 85% is discarded being this material mainly composed of fibers. Therefore, this study aims to develop and characterize a biodegradable material based on starch and gelatin, which was used for making disposable utensils with or without coconut fiber as well as assess their acceptance by the consumer. In the first step, preliminary tests were carried out for choosing the best formulations for the preparation of the trays. The pelletshave been prepared by thermoplastic extrusion and the selected formulations were those containing 10 to 20% gelatin and 25% (w/w) glycerol relative to starch. The thermal properties of the prepared material have been evaluated. From differential scanning calorimetry it was observed that the composites exhibited a glass transition temperature in the range between 50 and 60°C.

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