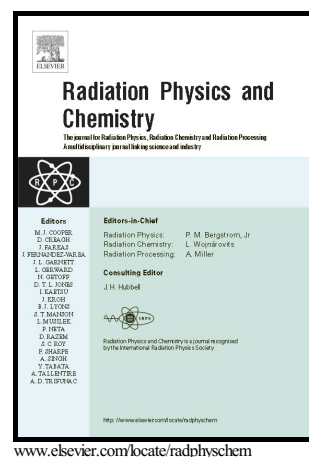


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COMPARISON OF GAMMA RADIATION EFFECTS ON NATURAL CORN AND POTATO STARCHES AND MODIFIED CASSAVA STARCH

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Abstract

The objective of this work was to evaluate the effect of irradiation treatment on physicochemical properties of three natural polymers, i.e. native potato and corn starches and a typical Brazilian product, cassava starch modified through fermentation -sour cassava- and also to prepare composite hydrocolloid films based on them. Starches were irradiated in a ^{60}Co irradiation chamber in doses up to 15 kGy, dose rate about 1 kGy/h. Differences were found in granule size distribution upon irradiation, mainly for corn and cassava starch but radiation did not cause significant changes in granule morphology. The viscosity of the potato, corn and cassava starches hydrogels decreased as a function of absorbed dose. Comparing non-irradiated and irradiated starches, changes in the Fourier transform infrared (FTIR) spectra in the 2000-1500 cm^{-1} region for potato and corn starches were observed but not for the cassava starch. Maximum rupture force of the starch-based films was affected differently for each starch type; color analysis showed that doses of 15 kGy promoted a slight rise in the parameter b^* (yellow color) while the parameter L^* (lightness) was not significantly affected; X-ray diffraction patterns remained almost unchanged by irradiation.

Keywords: starches, gamma radiation, viscosity, FTIR, XRD.

1. INTRODUCTION

Starches from different botanical origin have different biosynthetic mechanisms and may exhibit distinct molecular structure and characteristics as well as diversity in granule shape, size, composition, and other constituents (Jenking, Cameron & Donald, 1993). Biodegradable plastics are a solution to the environmental pollution derived the accumulation of plastic waste. Biodegradable films can be manufactured based on different starches and can include specific additives encapsulation (Gutierrez et al., 2015; Li et al., 2016).

Corn starch represents over 75% of the world's starch market (Demiate & Kotovicz, 2011). Potato starch is a very refined starch, containing minimal protein or fat. Cassava starch production in Latin America is located mainly in Southern Brazil. The production process for making starch from cassava is simple because cassava is a purer starch source than potato or cereals. These important sources of starch differ significantly in composition, morphology, thermal, rheological and retrogradation properties. Cereal starches contain a significant quantity of phospholipids, while potato starch is rich in esterified phosphorus. Potato starch exhibits higher swelling power, solubility, paste clarity and viscosity than wheat, rice or corn starch. Although native starches can be used as gelling agents in many gelling products depending on their source and availability, in many industrial utilizations physical and chemically modified starches are commonly used.

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