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Influence of crosslinking agents on the interaction between water molecules and packaging made from cellulose derivatives

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In order to reduce the environmental impact caused by plastic packaging, researchers are developing new biodegradable packaging from natural polymers. The greatest challenge is to obtain products that exhibit properties similar to or better than synthetic polymers, particularly competing with the low cost of petroleum-derived packaging. New low-cost biodegradable packaging, obtained from specific cellulose derivatives, can contribute to reducing the environmental impacts caused by conventional packaging. This study aims to synthesize new biodegradable packaging from hydroxypropyl methylcellulose (HPMC), with characteristics that mimic specific properties of polystyrene, and to evaluate the effect of crosslinkers citric acid (c.a) and CaCl2 (c.c) on the water resistance of these new packages. Contact angle measurements were performed using an optical tensiometer model Theta Lite (Biolin Scientific AB, Västra Frölunda, Sweden) to investigate the water affinity, wettability, and hydrophilicity of the samples. Measurements were taken in triplicate at three points on both the inner and outer walls, as well as the inner and outer base of the packages. The results showed that in samples with lower wettability (HPMC (83.9º ± 2.6 in 60 s) and HPMC-c.c (77.0º ± 15.6 in 60 s)), there is a tendency for reduced water resistance on the outer surface. The pure sample exhibited greater hydrophilicity on both the outer base and body of the packaging, while the CaCl2 sample showed greater susceptibility only in the outer region of the packaging body. This decrease in resistance and increase in interaction with the water droplet can be attributed to the higher capillarity of the region; during the packaging molding process, most of the water evaporation occurred in this area, leading to increased porosity. Based on these results, further investigations can be conducted to accredit these new packages as non-toxic, biodegradable materials with excellent properties capable of competing in the market in terms of price and quality compared to other packaging applied for food preservation.