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Study of water susceptibility in packaging composed of HPMC-Pectin foams and chemical crosslinking.

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Due to the severe environmental problems stemming from the production and utilization of petroleum-derived plastic packaging, there has been an increased quest for alternative raw material options, such as biodegradable foams composed of polymeric matrices sourced from natural and renewable origins, possessing properties akin to expanded polystyrene (EPS). This study endeavors to craft novel packaging solutions using hydroxypropyl methylcellulose (HPMC), pectin, and crosslinkers like citric acid and CaCl2, while exploring the impact of these crosslinkers on the material's hydrophilic attributes via contact angle analyses. Initially, four distinct sample types were generated, all comprising 3.5% w.v-1 of HPMC and 3.5% w.v-1 of pectin. Sample H-P-ca and the sample containing both crosslinkers (H-P-c.a+c.c) had 0.1% w.v-1 of citric acid added to them. Furthermore, samples H-P-c.c and H-P-c.a+c.c had 1.5% w.v-1 of CaCl2 incorporated, respectively. The selection of crosslinkers and their concentrations was based on studies conducted by the research group focusing on the synthesis and procurement of packaging materials and other polymeric substances. The contact angle results indicate that the addition of CaCl2 adversely affected the material's hydrophobicity. Samples H-P-c.c and H-P-c.a+c.c exhibited the lowest contact angle values on both the inner base and inner wall, with the lowest recorded value observed on the inner base of sample H-P-c.c (19.16° ± 3.91). These outcomes might be linked to the decrease in pore volume and the rise in material surface area interacting with water molecules in droplets due to the presence/concentration of the incorporated crosslinkers. However, data pertaining to sample H-P-ca suggest that the addition of citric acid could have a beneficial impact on the water susceptibility of these packages, with contact angle values approaching 90° noted after 60 seconds of measurement, similar to the analysis of the inner base of the sample with citric acid (85.74° ± 3.71). In conclusion, despite the results observed in samples with CaCl2, samples H-P and H-P-ca exhibited promising outcomes, particularly concerning the inner portions of the packages, which would necessitate reduced susceptibility to water molecules by the material. Thus, further studies could ascertain the potential of these samples for future applications as biodegradable food packaging.