Thermal Transport in Biopolymers with Borax as Crosslinking Agent

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In recent years, there has been considerable interest in the investigation of biopolymers based on renewable resources as alternatives to various petroleum-derived materials. This study focuses on assessing the heat transport in biodegradable films made from starch and caseinate and the role of borax as a cross-linking agent. Thermal diffusivity of the films was measured using photothermal radiometry, and reveals a clear dependence on borax concentration. Heat diffusion grows when borax concentration is increased up to reaching a maximum, and above this concentration thermal diffusivity decreases. These studies reveal the role of borax as a heat transport enhancement agent as well as a saturation limit in concentration to produce those effects. These findings open the possibility of using this kind of biodegradable films with added borax as packaging material, in which a good thermal exchange is required. This application could be helpful in extending shelf life and preserving the quality of perishable products, especially those requiring refrigerated storage. Furthermore, the proposed material could shield products from microbial contamination, delaying their deterioration process. This study opens new perspectives on the development of sustainable materials with practical applications in food product preservation and biomedicine.

Keywords: caseinate, Starch, biodegradable films, borax, photothermal radiometer