

## SODIUM TRIMETAPHOSPHATE CROSSLINKED STARCH FILMS REINFORCED WITH MONTMORILLONITE

K. Noulis, T. Fragkopoulos, A. Arampatzidou, L. Tsekmes, A. Marinopoulou, A. Goulas, V. Karageorgiou\*

Department of Food Science and Technology, International Hellenic University, Sindos, Greece

(\*[vkaraeorgiou@ihu.gr](mailto:vkaraeorgiou@ihu.gr))

### ABSTRACT

Synthetic polymers are the main food packaging material, although they are nonbiodegradable and their recycling process is expensive. A biodegradable, eco-friendly material, with high availability and of low cost, such as starch, is a promising solution for the production of films for food packaging. To enhance starch film mechanical and barrier properties, nanoclays have been incorporated within the film matrix. Crosslinking is a well-established method to modify starch properties, but it has not been investigated in combination with nanoclay addition. In the present study, films were developed with starch that was crosslinked through the addition of 5, 15 and 40% wt. sodium trimetaphosphate (STMP) based on dry starch weight. To investigate the interaction between crosslinking and nanoclay addition, montmorillonite (MMT) was added at a 10.5% wt. concentration based on dry starch weight. Experimental data revealed a synergistic effect between STMP crosslinking and MMT addition regarding film thickness, elongation at break, color properties and opacity. Regarding barrier properties, MMT addition negated the effect of STMP crosslinking, while, in the case of moisture content, it did not alter the effect of STMP crosslinking. Finally, in the case of tensile strength, a synergistic effect followed by a negative interaction was observed. In conclusion, the addition of MMT can potentially enhance, alongside with crosslinking, some properties of the films, while other properties are not affected any more than just by crosslinking.

**KEYWORDS:** starch films, sodium trimetaphosphate, montmorillonite