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Food-packaging-process interactions: Effects of ohmic heating on the properties of flexible packaging

Marangoni Júnior, L.(1); Rodrigues, R.(2); Pereira, R.(2); Augusto, P.E.D.(3); Ito, D.(4); Gomes, F.T.(4); Padula, M.(4); Vicente, A.(2); (1) UNICAMP; (2) UMINHO; (3) Université Paris-Saclay; (4) ITAL;

Ohmic heating (OH) is a very promising food processing technology as it can process food in a short period of time through electrical current. This technology is bringing a new paradigm to thermal food processing, reducing excessive thermal load and benefiting from the non-thermal effects of electric fields. OH has different applications including bleaching, extraction, sterilization and heating of foods and can be considered in the processing of packaged food. The aim of this research was to evaluate the effect of applying OH inside hermetically sealed packaging materials using different food simulants. The effects on the structure and properties of various packaging materials were evaluated. In this study, four multilayer flexible packaging materials: PETmet/PE, PETmet/PP, PET/Al/PE and PET/Al/PA/PP (PET: polyethylene terephthalate, met: metallized, PE: polyethylene, PP: polypropylene, Al: aluminum foil and PA: polyamide) was evaluated. The packages were filled with solutions of 3% acetic acid and 0.1% sodium chloride, processed by OH at 80 °C for 1 min (20 kHz), and evaluated for their structure (FT-IR, XRD, DSC and SEM) and performance properties (tensile strength, seal strength and barrier). The samples did not show changes in chemical groups nor thermal properties. However, the simulator-packaging-processing interaction resulted in changes in crystallinity, morphology, mechanical and barrier properties, especially for metallized films in contact with acidic food simulants. The main changes in terms of properties were observed in the loss of oxygen barrier of the metallized films. However, although the food-packaging-processing interaction resulted in some modifications to the packaging materials under study, they can be used for this application, as long as it is assessed whether these modifications will not have a negative impact on the quality of foods.