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Food-packaging-process interactions: Effects of ultrasound processing on the properties of metallized flexible packaging in contact with acidic food simulants

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The demand for emerging food processing technologies is increasingly present in the scientific and industrial world. Ultrasonic processing of packaged foods is already being considered a solution as it reduces the risks of post-process contamination. However, it is essential to evaluate which packaging materials can be used to package foods that will be processed by ultrasound. The aim of this research was to evaluate the interactions between acidic food simulant, metallized packaging and ultrasound processing. Two metallized packaging materials (PETmet/PE and PETmet/PP) were selected, which were filled with acidic food simulant and processed by different ultrasound conditions in an ultrasonic bath (frequency of 25 kHz, volumetric power of 8.75 W/L, temperature of 25 °C and 60 °C for 60 min). The packages were evaluated before and after ultrasound processing for their chemical structure, thermal behavior, crystallinity, morphology, mechanical properties, barrier properties and migration potential. The crystallinity index was influenced by ultrasound, reducing from 69.3% to 67.0% and from 56.4% to 46.7% in PETmet/PE and PETmet/PP films, respectively. Furthermore, from the images obtained by scanning electron microscopy, a discontinuity of metallization was observed as a result of ultrasound, which directly influenced the 10-fold increase in the oxygen transmission rate values of the films processed by US/25°C/60min. Loss of moisture barrier has also been observed as a result of ultrasound processing. For the PETmet/PP sample, a reduction in seal strength was also observed. Finally, ultrasound did not cause or induce small changes in the chemical groups, melting temperature, tensile strength and migration potential of the films. Therefore, due to the significant loss of barrier caused by the ultrasound process at 25 °C for 60 min, the packaging studied is not recommended for this application under these conditions, since this loss of barrier can directly influence the stability of foods treated by ultrasound.