Optical and thermal properties of Mexican native maize and tortilla

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Maize is one of the most important cereal grains in global production, economy, and consumption. It is a staple food that provides nutrients to the population and is consumed in different forms depending on the region of the world. In Mexico and some regions of Latin America, corn is frequently nixtamalized for making table tortillas and other foods; this process gives good properties, both physically and nutritionally [1,2]. Photoacoustic spectroscopy (PAS) has been considered a potential tool for the optical characterization of the different components found in foods [3]. In this work, PAS is used to analyze the optical absorption spectra to determine the changes in phytochemical compounds in the tortilla production process of six Mexican native maize grains (NMG). The nixtamalized dought of each NMG is blended with different concentration percentages of turmeric (TC) to make tortillas later. The correlation between the optical absorption spectra generated by the phytochemical compounds and TC concentration rates for native maize dough (NMD) and tortillas (NMT) is obtained by PAS. The photoacoustic spectra of pure NMG are shown in Figure 1. In these spectra it is possible to observe an absorption band, from 300 nm to 450 nm, corresponding to the optical absorption of phenolic acids and flavonoids [4]. The absorption band of anthocyanins (525 nm) in NMG varies significantly depending on the maize genotype, obtaining a higher absorption signal for those with orange, blue and red colorations than those with light yellow or white appearance [5].

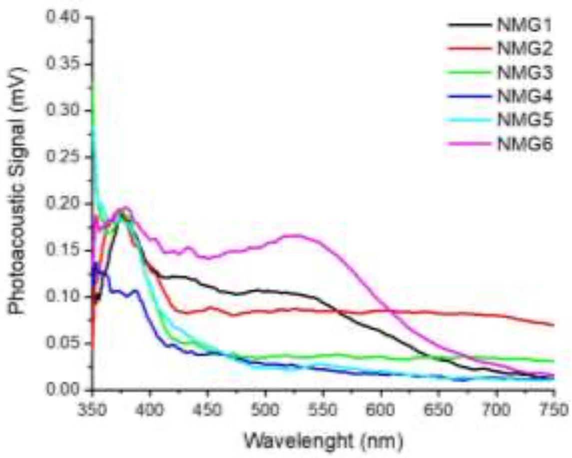

Fig. 1. Optical absorption spectra, obtained by photoacoustic spectroscopy of different Mexican native maize grains (NMG).

To determine the changes in thermal parameters due to nixtamalization and the process to make tortillas, the thermal effusivity (e) and diffusivity (α) of each NMD, NMT, and their corresponded TC blends, are measured by using the Front Photopyroelectric (FPPE) configuration and the Open Photoacoustic Cell (OPC) techniques, respectively. Then, the thermal conductivity (k) and the heat capacity per volume unit (ρc) are calculated by the relationships $k = e\sqrt{\alpha}$ and $\rho c = k/\sqrt{\alpha}$.

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