Sustainable long chain polyester bioplastics from tomato peel waste sources

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Tomato peels are an abundant raw material for multifunctional fatty acids. After peels' depolymerization using NaOH solutions, their chemical composition shows three main components: 10,16-dihydroxyhexadecanoic (43.2 wt.%), 9,12-octadecadienoic (16.1 wt.%), and 9-octadecenoic (11.9 wt.%) acids, respectively. Such monomers have been polymerized by a solvent-free melt-polycondensation method in the presence of $Sn(Oct)_2$, producing free-standing films. The conditions of the polycondensation were optimized in terms of temperature (150, 175, and 200°C), time of reaction (1, 3, 5, and 7 hours), and load of catalyst (0, 0.02, 0.05 and 0.1 mmol). The kinetic and thermodynamic parameters of the reaction were calculated by infrared spectroscopy (Figure 1a) of the resultant samples synthesized in the above conditions. Mechanical, hydrodynamic (Figure 1b) and thermal properties of free-standing films were related to the degree of polymerization and the amount of catalyst used for the polymer matrix synthesis.

Figure

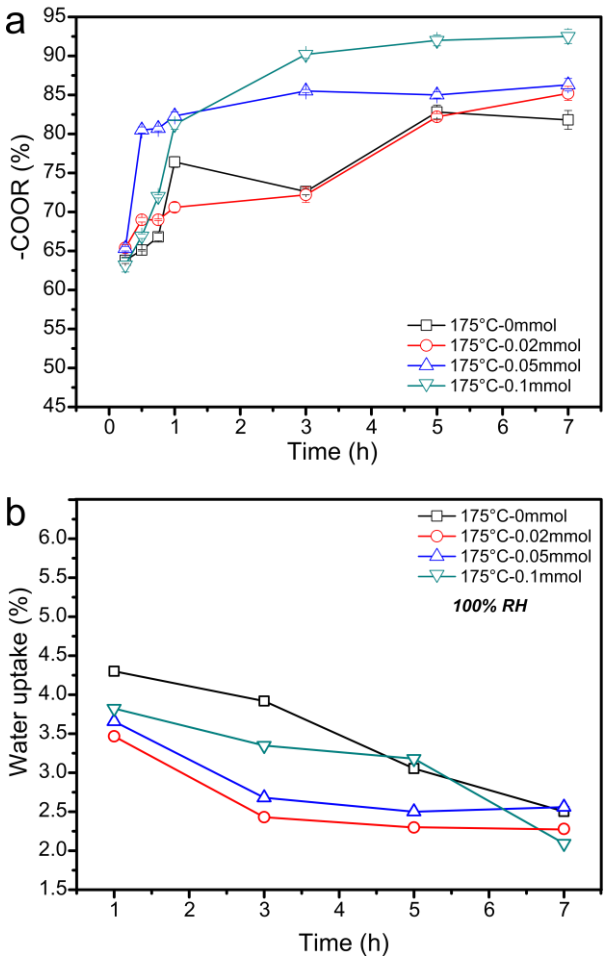

Figure 1: (a) Deconvolution of the carboxylate band using infrared spectroscopy and (b) Water uptake of the films in function of reaction time and catalyst concentration at 175°C, respectively.