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Molecular Dynamics of Poly(L-lactic acid), Poly(glycolide) and their Copolymer by Dielectric Relaxation Spectroscopy

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An investigation was carried out of the molecular dynamics of poly(L-lactic acid) (PLLA), poly(glycolide) (PGA) and their PGA/PLLA (92/8) copolymer in their wholly amorphous state and during crystallization. Experimental results were generated over a wide range of temperature and frequency by broad-band dielectric relaxation spectroscopy (DRS). The variation of the average relaxation time (defined as $\tau = 1/2\pi f_{\max}$ where f_{\max} is the frequency at maximum loss for the α process) is studied during cold crystallization. The temperature dependence of the average relaxation time for wholly amorphous and crystallized samples is analyzed. The sensitiveness of the segmental dynamics to the degree of crystallinity is analyzed, taking into account the relaxing segments and the amorphous layers between lamellae. Supporting evidence about their thermal behaviour is obtained with DSC. The evolution of the morphologies obtained during crystallization processes is followed by optical microscopy.