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Enhanced segmental mobility of Poly(lactic acid) in presence of water OMKAR VYAVAHARE, SHAW HSU, University of Massachusetts Amherst — The objective of this work was to understand the effect of water on the segmental mobility of Poly(lactic acid) (PLA). When PLA was crystallized by soaking it in water, the crystallization temperature was lowered significantly, allowing PLA to crystallize even below the generally accepted glass transition temperature (T_g). PLA crystallized below 90°C has a metastable α' crystalline phase. However, in presence of water, it formed a mixture of α', and stable α crystalline phases. Water also had a prominent effect on the physical aging of PLA, with the polymer rapidly undergoing densification in the glassy state compared to the dry conditions. Dielectric relaxation studies of PLA with 0% and 13% d-lactide content revealed contradictory influence of water on their respective sub-T_g (β) transitions. The β transition was suppressed for PLA with no d-lactide content, while it got enhanced for PLA with 13% d-lactide. These experiments demonstrate that water promotes interchain interactions and enhances segmental mobility. This allows the chains to have a conformation which provides an easier pathway with lower energy barrier for the transformation among various polymorphic states.

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