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Abstract Title: Influence of Methanol on Induced Crystallization of Submerged Poly(lactic acid) Films

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Influence of Methanol on Induced Crystallization of Submerged Poly(lactic acid) Films

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Poly(lactic acid) – PLA is a valuable food packaging material since it is derived from biobased resources and it is industrially compostable. A concern in PLA-based food packaging is the migration of organic compounds, such as alcohols, which can alter the material's crystallinity during product exposure. This study quantified the crystallinity evolution of PLA films immersed in pure methanol at different exposure temperatures (0.9°C, 10.9°C, 20.9°C, and 30.9°C) under and above the *in-situ* glass transition temperature ($T_{g\ in\text{-}situ}$ = 15.2 °C) of PLA films in pure methanol. The Avrami model was used to describe the evolution of crystallinity in semicrystalline PLA. The Avrami constant (k) and exponent parameters (n) were estimated in this work with low standard errors through the ordinary least squares (OLS) method and were found not to be correlated by conducting scaled sensitivity coefficients (SSC) estimation. Bootstrapping was performed due to a limited sample size. Both bootstrap confidence and prediction bands were found to be narrower than asymptotic confidence and prediction bands (α=0.05) at all the experimental temperatures. A left-skewed distribution was found in the residual histogram at 20.9°C. A better fit was found at temperatures above $T_{g\ in\text{-}situ}$, as the crystallinity of PLA films maintains relatively low values at temperatures below $T_{g\ in\text{-}situ}$ due to limited PLA's chain mobility and crystallization. This study advances the development of biobased, compostable aliphatic polyester packaging for containing methanol solutions.