Supplementary Materials

Synthesis of PLA/PCL systems by TiO_2-SiO_2 for obtaining biopolymers with photocatalytic functionality

Gamaliel Alvarado-Molina[1], Pamela Nair Silva-Holguin[1], Nahum A. Medellín-Castillo[2], Manuel Sánchez Polo[3], Ericka Berenice Herrera-Ríos[4], Claudia Alejandra Hernández-Escobar[5], Mónica Elvira Mendoza-Duarte[5], Armando Erasto Zaragoza-Contreras[5] and Simón Yobanny Reyes-López[1]*

Supplementary FTIR Analysis: This section compiles the complete FTIR characterization of the TiO_2–SiO_2 system, the DESm LLA/ε-CL mixture, and the PLA/PCL-based materials. These results complement the discussion presented in the main manuscript and provide detailed spectral evidence supporting the proposed reaction mechanisms and structural evolution.

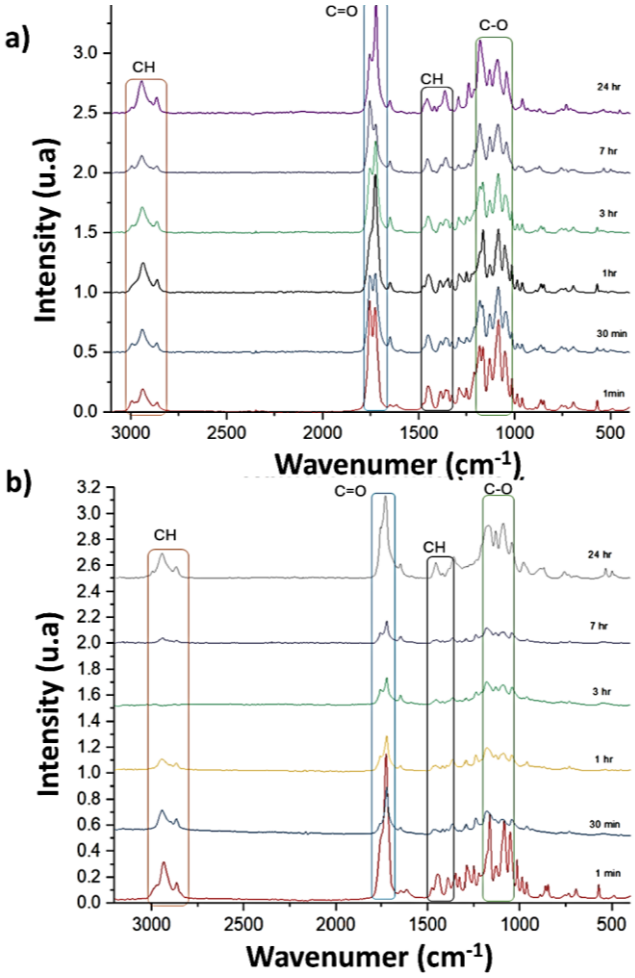


Figure S1. FT-IR spectra of PLA-PCL at different reaction times (from 1 minute to 24 hours), where: a) 0.1 wt% TiO_2-SiO_2 is used at different reaction times, and b) 1 wt% TiO_2-SiO_2 is used at different reaction times.

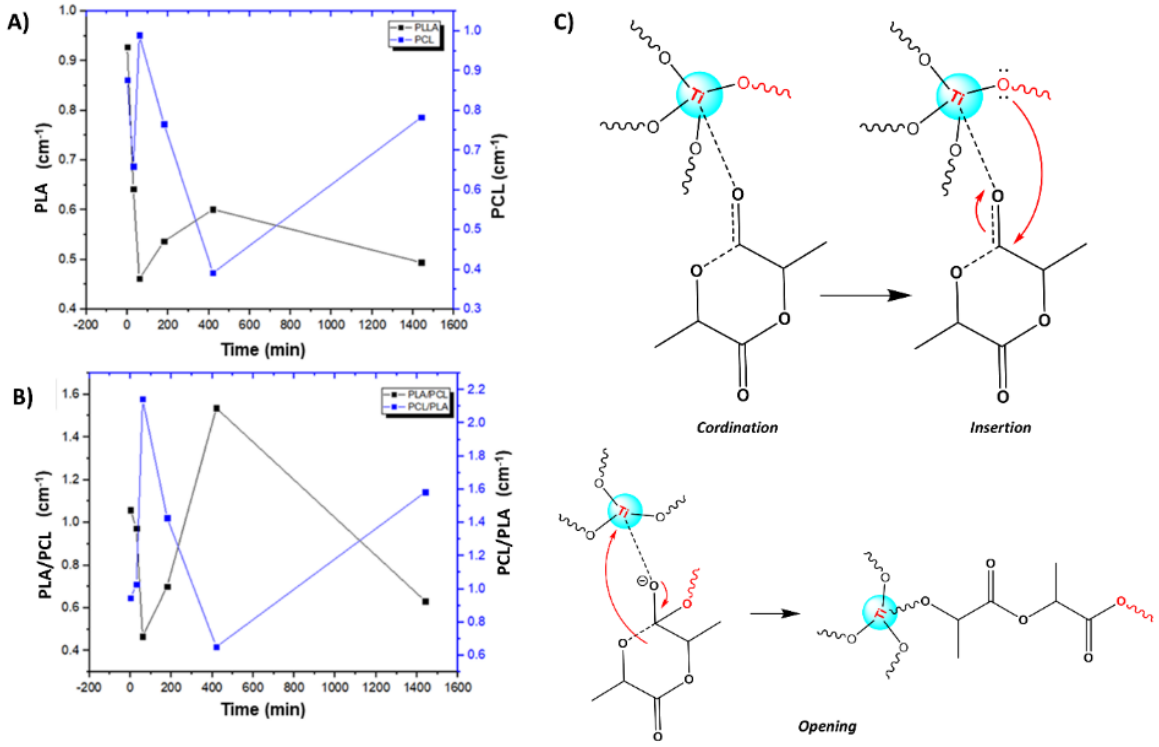


Figure S2. Comparison of the area under the curve for the carbonile group obtained via FT-IR. A) PLA versus PCL, B) PLA/PCL versus inverse PCL/PLA ratios, and C) Proposed coordination-insertion reaction mechanism for the ring-opening polymerization (ROP) of LLA.

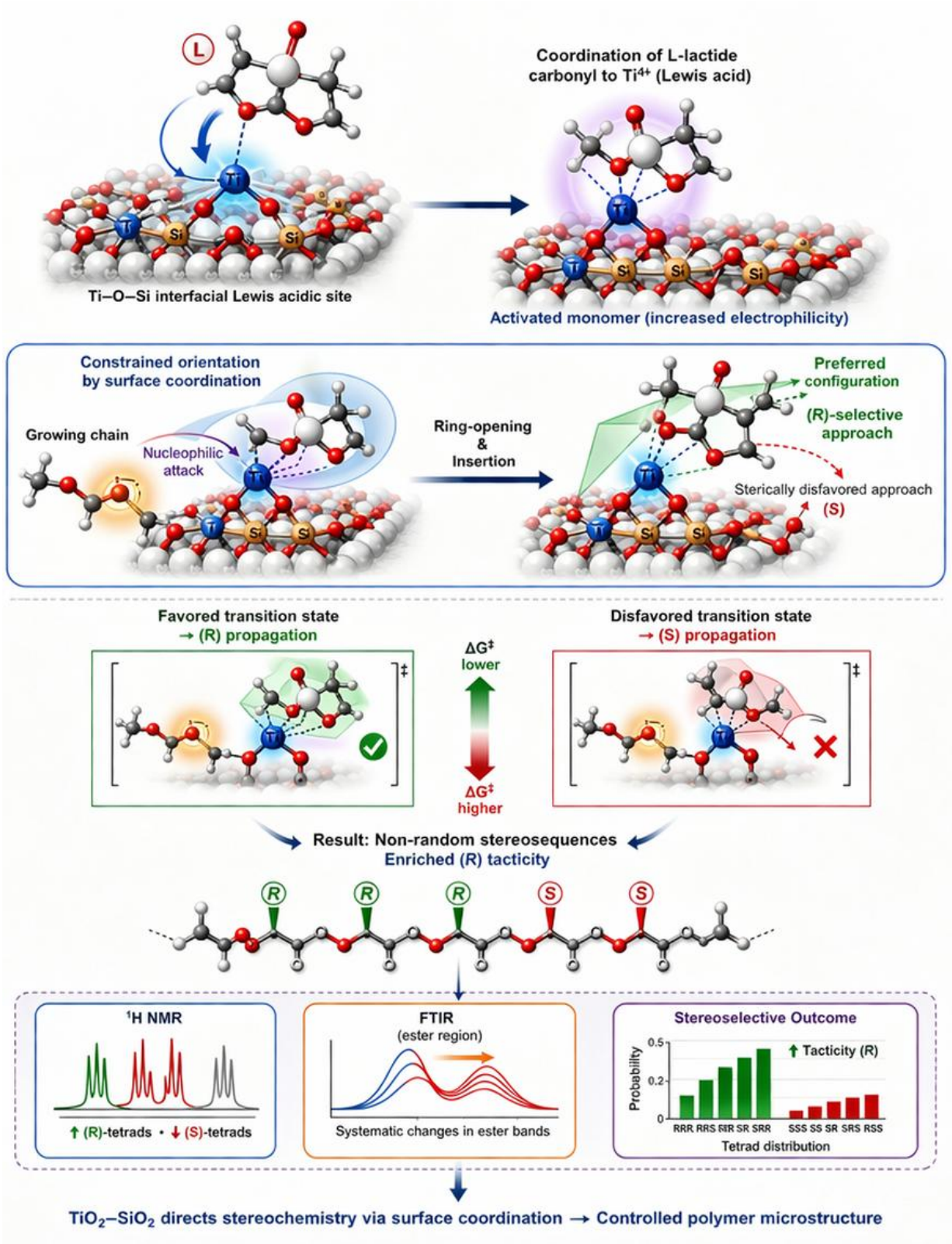


Figure S3 Mechanistic Representation of TiO_2–SiO_2-Induced Stereoselective Ring-Opening Polymerization via Coordination–Insertion Pathway

Supplementary statistical analysis

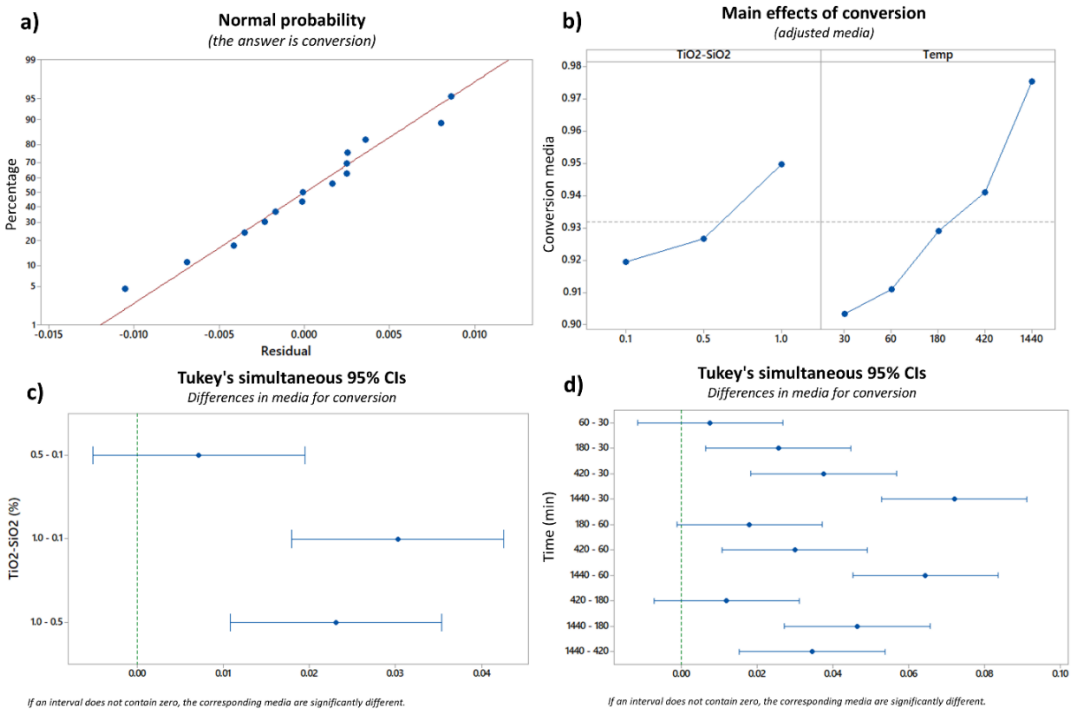


Figure S4. Statistical analysis of the influence of TiO_2-SiO_2 concentration, temperature, and reaction time on the average conversion in obtaining PLA/PCL.

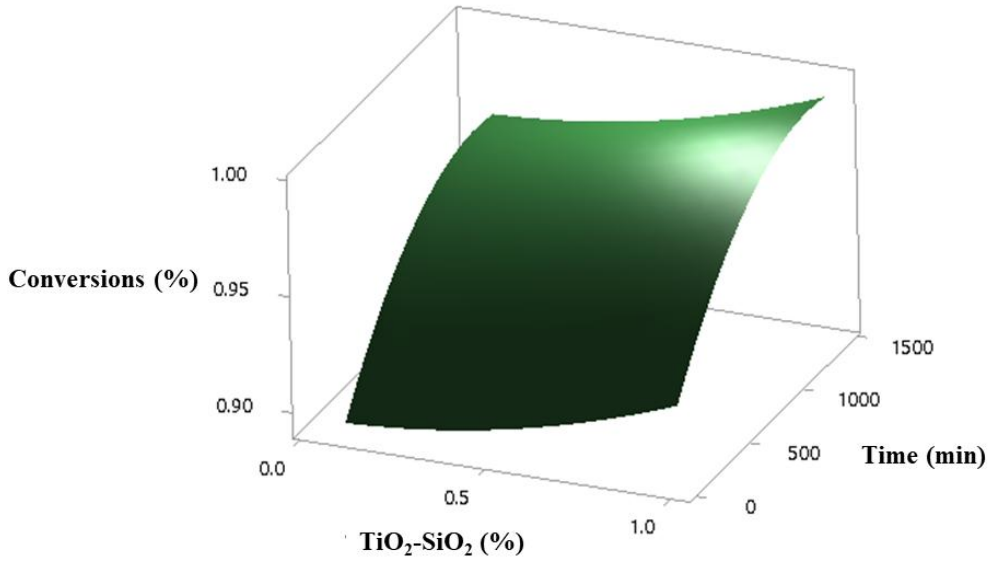


Figure S5. Response surface of different %wt of TiO_2-SiO_2 and different reaction times versus conversion for obtaining PLA/PCL

Supplementary mechanical analysis

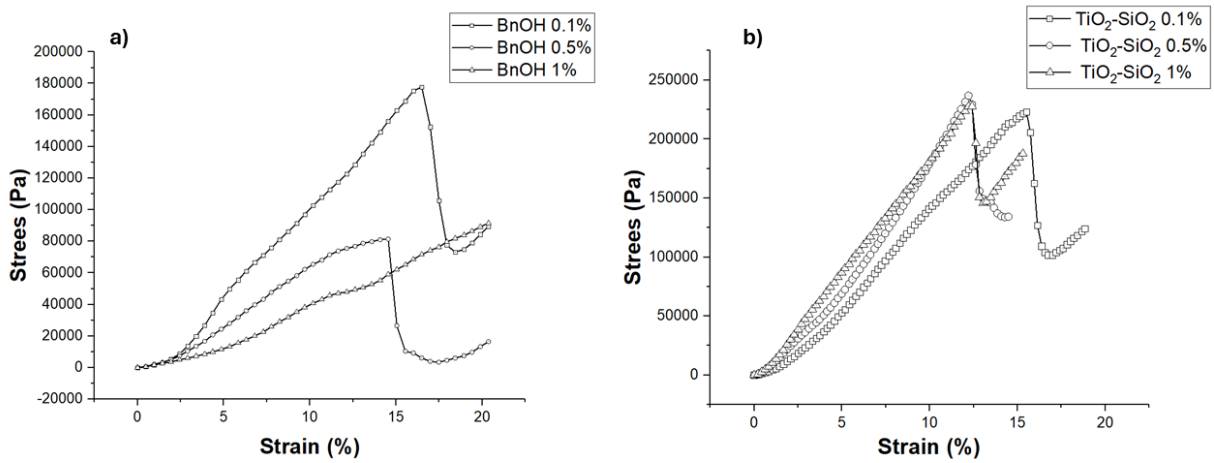


Figure S6. Stress-strain curves from the dynamic mechanical analysis of PLA-PCL using different weight percentages of TiO_2-SiO_2 during polymerization. The comparison is made between a) using BnOH as the initiator and b) using TiO_2-SiO_2 as the initiator.