

“Synthesis and Characterization of Low Molecular Weight Polylactic Acid”

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Chemistry 345
October 13, 2003

Poly(lactic acid), derived from polymerization of (D,L)-lactic acid, has been used for a broad range of applications, including biomedical uses. Requirements for biomedical poly(lactic acid) include purity (free of solvents, catalysts, and other byproducts), molecular weights around 3000, and formability (ease of machining into microspheres or tablets). High purity is necessary to avoid toxins in the body. Molecular weights of around 3000 are ideal in that they easily contain drug molecules within the structure and provide for its slow release. An easy, contaminant free, inexpensive route to poly(lactic acid) was desired.

The polymerization of (D,L)-lactic acid without catalysts and under an azeotropic solvent was studied. The use of xylene as the azeotropic solvent gave low molecular weights and low purity. Post-curing increased the molecular weight slightly. Polycondensation under vacuum produced a reaction with poor control and yielded low molecular weights. Use of high temperatures, 220°C, and nitrogen flow produced a pure product with molecular weights around 3000 and without thermal degradation, which is ideal for biomedical applications.

Bibliography

Proikakis, C.S.; Tarantili, P.A. and Andreopoulos, A.G. *J. Elastom. Plast.* **2002**, *34*, 49-63.

Garlotta, D. *J. Polym. Environ.* **2001**, *9*, 63-84.

Kim, K.W. and Woo, S.I. *Macromol. Chem. Phys.* **2002**, *203*, 2245-2250.