Biodegradable Polymers Based on Renewable Resources. III. Copolyesters Composed of 1,4:3,6-Dianhydro-D-glucitol, 1,1-Bis(5-carboxy-2-furyl)ethane and Aliphatic Dicarboxylic Acid Units

MASAHIKO OKADA, KOUJI TACHIKAWA, KEIGO AOI

Department of Applied Molecular Biosciences, Graduate School of Bioagricultural Sciences, Nagoya University, Furo-cho, Chikusa-ku, Nagoya 464-8601, Japan

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ABSTRACT: Various copolyesters were synthesized by bulk polycondensation of the respective combinations of 1,4;3,6-dianhydro-D-glucitol (**1**) as the diol component and 1,1-bis[5-(methoxycarbonyl)-2-furyl]ethane (**3b**) and seven dimethyl dialkanoates with methylene chain lengths of 4, 5, 6, 7, 8, 10, and 12 (**4a–4g**) as the dicarboxylic acid components. Most of the copolyesters were amorphous, while a copolyester composed of **1**, **3b**, and dodecanedioic acid (**4g**) (**3b**:**4g** = 25:75) units as well as homopolyesters derived from **1** and azelaic acid (**4d)**, sebacic acid (**4e**), and dodecandioic acid (**4g**), respectively, were partially crystalline. All these homo- and copolyesters were soluble in chloroform, dichloromethane, pyridine, trifluoroacetic acid, and *m*-cresol. The number-average molecular weights of these polyesters were estimated to be in the range of 10,000–20,000 by SEC using chloroform as an eluent and standard polystyrene as a reference. The biodegradability of these copolyesters was assessed by enzymatic degradation using four different enzymes in a phosphate buffer solution at 37°C and by soil burial degradation tests in composted soil at 27°C. In general, biodegradability of the copolyesters decreased with increase in the difuran dicarboxylate **3b** content. Copolyesters containing sebasic acid **4e** units showed higher biodegradability. Soil burial degradation in the soil that was treated with antibiotics, together with electron microscopic observation, indicated that actinomycetes are mainly responsible for the degradation of the copolyesters containing **3b** units in the present soil burial test. J Appl Polym Sci 74: 3342–3350, 1999

Key words: biodegradable polymer; copolyester; furan derivative; glucose derivative; enzymatic degradation

Correspondence to: M. Okada.

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