

# INFLUENCE OF SYNTHETIC POLY([R,S]-3-HYDROXY-BUTYRATE) ON DEGRADABILITY OF NEW POLYURETHANES

*J. Brzeska<sup>a</sup>, M. Rutkowska<sup>a</sup>, H. Janik<sup>b</sup>, P. Dacko<sup>c</sup>, M. Kowalczyk<sup>c</sup>*

*<sup>a</sup>Gdynia Maritime University, Dep. of Chemistry and Indust.  
Commodity Sci, Gdynia, Poland*

*<sup>b</sup>Gdańsk University of Technology, Department of Polymer  
Technology, Gdańsk, Poland*

*<sup>c</sup>Polish Academy of Science, Centre of Polymer and Carbon Material,  
Zabrze, Poland*

The aim of the present study was to obtain the new biodegradable polyurethanes (PURs) which have the potential to be used as drug delivery systems.

Prepolymers of PURs were prepared from polytetramethylene glycol (PTMG) and atactic poly[(R,S)-3-hydroxybutyrate] (a-PHB) [1] or polycaprolactone diol (PCL) and a-PHB with 4,4'-diisocyanate dicyclohexylmethane (H<sub>12</sub>MDI). Molar concentration of a-PHB in soft segment was 23%. The reaction was carried out at 70°C, for 2h. The prepolymer was dissolved in DMF and then was extended by 1,4-butane diol [2]. For comparison PURs without a-PHB and PURs based on 4,4'-diisocyanate diphenylmethane (MDI) were also prepared.

The hydrolytic degradation was carried out at 37°C for 36 weeks, using phosphate buffer solution (pH = 7.41) [3]. The oxidative degradation was done by using 0.1M CoCl<sub>2</sub> in 20% H<sub>2</sub>O<sub>2</sub> at 37°C for 16 weeks [4].

The rate of degradation, in both environments, was faster for aliphatic PURs based on PTMG than on PCL. Those results were expected for oxidative, but were very surprised for hydrolytic degradation. This could be explained by the higher water uptake of PURs based on PTMG than on PCL [unpublished data].

After introduction of a-PHB, into the soft segments of PURs based on PTMG, the hydrolysis kinetic was changed but at the end of experiment the weight loss was similar for PUR obtained with and without a-PHB. The higher weight loss during hydrolysis was observed for PURs containing H<sub>12</sub>MDI in hard segments than in PUR based on MDI. It could be explained by incomplete development of hydrogen bonding networks of PURs with H<sub>12</sub>MDI (much higher water uptake [unpublished data]).

Presence of a-PHB in PURs structure changed the degradability kinetic, what could be useful during the designing of novel, degradable materials for medicine.

- [1]. Jedliński Z., et al., *Biological Macromolecules*, **1999**, 25, 247
- [2]. Brzeska J., et al., Patent Application, No P385530, **2008**
- [3]. Glarner M., Gogolewski S., *Polymer Degradation and Stability*, **2007**, 92, 310
- [4]. Christenson E.M., et al., *Biomaterials*, **2006**, 27, 3920

## **COMPOSITES OF GLASS MATE AND STYRENE CROSS-LINKED DIETHYLENE GLYCOL BASED POLY(ESTER-ETHERURETHANE)S**

*Justyna Kucińska-Lipka, Helena Janik*

*Gdansk University of Technology, Chemical Faculty, Polymer  
Technology Department, Narutowicza Street 11/12,  
80-233 Gdansk, PL*

This work presents the results of the investigation on preparation and mechanical properties of poly(ester-etherurethane)-glass mate composites, which were prepared in three-stage procedure.

In the first stage unsaturated oligo(ester-ether) (OAEE) were obtained in a polycondensation process from the following substrates: diethylene glycol (GD), adipic acid (KA), maleic anhydride (BM) and poly(ethylene glycol) (POE).

In the second stage the unsaturated OAEE were used as the substrates to receive unsaturated poly(ester-etherurethane)s (PEEUR) in two step process. First quasi-prepolymers (QPRE) from the unsaturated OAEE and 4,4'-diphenylmethane diisocyanate (MDI) were synthesised. Then urethane prepolymers (PRE), were obtained by elongation of the urethane quasi-prepolymers with oligo(alkylester-ether)diols. After that styrene and initiators such as methyl ethyl ketone peroxide (MEKPO) and cobalt 2-ethyl cyclohexanoate (EtHCo) were added to urethane prepolymers.

In the third stage poly(ester-etherurethane) glass mate composites were obtained by impregnation of glass mate with unsaturated PEEUR and