

CHEMICAL RECYCLING OF PET BY GLYCOLYSIS. Alkyd Resins Derived from the Glycolised PET

G.P. KARAYANNIDIS, D.S. ACHILIAS^{*}, I. SIDERIDOU and D.N. BIKIARIS

Laboratory of Organic Chemical Technology, Department of Chemistry
Aristotle University of Thessaloniki, 541 24 Thessaloniki – GREECE

^{*}E-mail: axilias@chem.auth.gr

EXTENDED ABSTRACT

Poly(ethylene terephthalate) (PET) is one of the versatile engineering plastics which is used to manufacture mainly textiles and bottles for packaging. The overall world consumption of PET amounts to about 13 million tons, of which 9.5 million tons are processed for the textile industry, 2 million tons are consumed in the manufacture of audio and video tapes and 1.5 million tons are used in the manufacture of various types of packaging (mainly bottles). In Greece, the main part of mineral water, a great part of olive and other seed-oils and all soft drinks are offered now in PET bottles.

PET recycling represents one of the most successful and widespread examples of polymer recycling. During the last six years an 8-fold increase in the amount collected for recycle in Western Europe has been observed. The main driving force responsible for this extremely increased recycling of post-consumer PET is its widespread use, particularly in the beverage industry since it does not have any side effects on the human organism. It should be pointed out, that PET does not create a direct hazard to the environment but, due to its substantial fraction by volume in the waste stream and its high resistance to the atmospheric and biological agents, it is seen as a noxious material. Therefore, the recycling of PET does not only serve as a partial solution to the solid waste problem but also contribute to the conservation of raw petrochemical products and energy.

A successful recycling programme does not only depend on post-consumer waste collection. It is also depends on whether the products made out of collected, reclaimed and recycled material respond to consumers' needs, in other words if recycled products are actually bought. This is the reason why the PET industry constantly researches for reclaimed material new applications. Recently, a growing interest has been observed in the use of PET wastes for the production of specialized products such as unsaturated polyester, polyurethane foams and polymer concrete.

In this study the glycolysis of PET taken from common soft drink bottles, is examined. Diethylene glycol (DEG) is used for the depolymerization of PET in several molar ratios. The oligomers obtained are analyzed and identified. Furthermore, its potential use as raw materials in the production of secondary, specialized products, such as alkyd resins used as enamel paints or coatings is investigated. Given the scale of production of alkyd resins this new use of the recycled PET in alkyd resin syntheses provides a beneficial means for mass consumption of recycled PET.

Key words: PET, recycling, glycolysis, plastics recycling, alkyd resins, coating resins, curing of unsaturated polyesters