

Accepted Manuscript

Valuable secondary raw material by chemical recycling of polyisocyanurate foams

Michele Modesti, Francesca Costantini, Eleonora dal Lago, Francesca Piovesan, Martina Roso, Carlo Boaretti, Alessandra Lorenzetti



PII: S0141-3910(18)30272-6

DOI: [10.1016/j.polyimdegradstab.2018.08.011](https://doi.org/10.1016/j.polyimdegradstab.2018.08.011)

Reference: PDST 8624

To appear in: *Polymer Degradation and Stability*

Received Date: 3 May 2018

Revised Date: 31 July 2018

Accepted Date: 20 August 2018

Please cite this article as: Modesti M, Costantini F, Lago Ed, Piovesan F, Roso M, Boaretti C, Lorenzetti A, Valuable secondary raw material by chemical recycling of polyisocyanurate foams, *Polymer Degradation and Stability* (2018), doi: 10.1016/j.polyimdegradstab.2018.08.011.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Valuable secondary raw material by chemical recycling of polyisocyanurate foams

Michele Modesti, Francesca Costantini, Eleonora dal Lago, Francesca Piovesan, Martina Roso, Carlo Boaretti, Alessandra Lorenzetti (*)

Department of Industrial Engineering, University of Padova, Padova, Italy

Abstract

The main aim of this paper was to study the recyclability of polyisocyanurate (PIR) wastes with high isocyanate index by glycolysis and identify the optimal reaction conditions to obtain a product suitable for the reuse in the production of new rigid foams. Indeed, to our best knowledge, there are no information available concerning the glycolysis of PIR foams, whose highly cross-linked and stable structure may prevent glycolysis process to take place.

A detailed study of the influence of the process variables on the properties of the recovered products has been performed in order to identify the optimal reaction conditions, focusing on the mass ratio of glycol to foam, the catalyst concentration and temperature.

The results showed that, despite the high thermal stability claimed for isocyanurates, a glycolysis process in presence of dipropylene glycol, as glycolysis agent, and potassium acetate, as catalyst, can be successfully carried out even with PIR foams with extremely high isocyanate index. Under proper conditions, the original highly cross-linked structure of the polymer can be converted into a liquid, single phase, mixture of highly branched oligomers terminated with hydrogen active groups which was suitable to be used in the synthesis of new rigid foams. Due to the high functionality of the glycolysis products and their compatibility with isocyanates, the mechanical properties of specimens based even on high amounts (up to 75%) of glycolysis polyols turned out to be higher or either very close to those of standard specimens based on virgin polyol only.

Keywords: polyisocyanurate, glycolysis, chemical recycling, degradation, polyols

(*) Corresponding author: via F. Marzolo 9, IT-35131 Padova. alessandra.lorenzetti@unipd.it; phone +39 049 8275556; fax +39 049 8275555

Download English Version:

<https://daneshyari.com/en/article/9953417>

Download Persian Version:

<https://daneshyari.com/article/9953417>

[Daneshyari.com](https://daneshyari.com)