

Accepted Manuscript

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PII: S0014-3057(13)00166-3

DOI: <http://dx.doi.org/10.1016/j.eurpolymj.2013.03.034>

Reference: EPJ 6043

To appear in: *European Polymer Journal*

Received Date: 17 December 2012

Revised Date: 27 February 2013

Accepted Date: 25 March 2013

Please cite this article as: Murray, K.A., Kennedy, J.E., McEvoy, B., Vrain, O., Ryan, D., Cowman, R., Higginbotham, C.L., The influence of electron beam irradiation conducted in air on the thermal, chemical, structural and surface properties of medical grade polyurethane, *European Polymer Journal* (2013), doi: <http://dx.doi.org/10.1016/j.eurpolymj.2013.03.034>

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Title: The influence of electron beam irradiation conducted in air on the thermal, chemical, structural and surface properties of medical grade polyurethane

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Abstract

It is well known that polyurethane (PU) provides good irradiation resistance; however, extremely high irradiation doses can alter the structure and/or function of macromolecules, resulting in oxidation, chain scission and crosslinking. In this present study, modifications to the material characteristics resulting from irradiation were extensively examined through a broad array of analytical techniques. Fourier transform infrared spectroscopy (FTIR) revealed that there were a number of changes to the chemical structure after electron beam irradiation while dynamic frequency sweeps identified an occurrence of crosslinking particularly in the higher irradiation doses. The degree of crosslinking was further analysed by implementing the crosslink density experiment, which illustrated a high level of crosslinking at 200kGy only. X-ray diffraction (XRD) and differential scanning calorimetry (DSC) identified an increase in phase segregation and as a consequence it could lead to soft segment mobility. This increase in mobility could be responsible for an increase in the degree of chain orientation. Surface morphology of the electron beam irradiated material was determined using scanning electron microscope (SEM) imagery and this provided evidence that the

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