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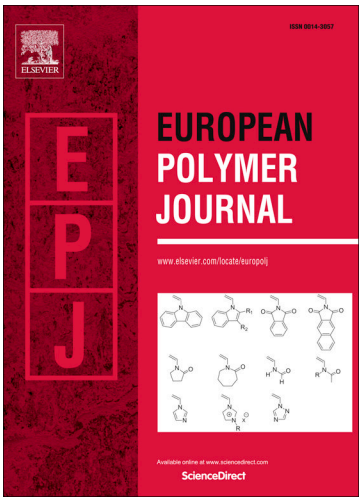

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C. Huang, N.L. Thomas

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Fabricating Porous Poly(lactic acid) Fibres via Electrospinning

C Huang and N L Thomas*

Department of Materials, Loughborough University, Ashby Road, Loughborough, Leicestershire, LE11 3TU, UK
*N.L.Thomas@lboro.ac.uk, Tel. +44(0)1509223334

Abstract

In this paper, amorphous poly(lactic acid) (PLA), a biodegradable polymer with excellent bio-compatibility, is successfully electrospun into micron-sized fibres with controlled surface and internal morphologies. By careful solvent selection, either surface porosity or internal porosity can be achieved through different mechanisms. Use of chloroform as the solvent gives rise to circular pores of 100 nm diameter confined to the surface. These are obtained in humid conditions by the so-called 'Breath Figure' mechanism. It is found that combining chloroform with a water-miscible non-solvent yields either surface porosity (wrinkled effect) using a low boiling point liquid, e.g. ethanol, or internal porosity using a high boiling point liquid, e.g. dimethyl sulphoxide (DMSO). Both these microstructures are obtained through a non-solvent induced phase separation (NIPS) mechanism. Finally, it is found possible to produce both surface and internal porosity using DMSO by a vapour induced phase separation (VIPS) mechanism. The porous electrospun PLA mats were shown to exhibit significantly increased oil absorption capacity compared with the non-porous fibre mats.

Keywords: electrospinning; porosity; poly(lactic acid); PLA; mechanisms;