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# Effect of Nanoscale Dispersed Silica on the Fabrication of Microporous Poly(L-lactic acid) by Uniaxial Stretching

Yunjing Chen [a, b], Lijing Han [a, *], Helong Chen [c], Shiling Jia [a, d], Lisong Dong [a,*]

[a] Key Laboratory of Polymer Ecomaterials, Changchun Institute of Applied Chemistry, Chinese Academy of Sciences, Changchun 130022, P.R. China

[b] University of Science and Technology of China, Hefei 230026, P.R. China

[c] PetroChina Tarim Oilfield Company, Korla 841000, P.R. China

[d] Changchun University of Technology, Changchun 130012, P.R. China

[*] *E-mail address:* ljhan@ciac.ac.cn, dongls@ciac.ac.cn.

**Abstract:** The microporous poly(L-lactic acid) (PLLA) was prepared successfully by uniaxial stretching PLLA with nanoscale dispersed silica as pore forming agent. The SEM results revealed that the silica dispersed uniformly in the PLLA matrix with the form of monodispersed nanoparticles or nanoscale aggregates when the content was 3 - 20 wt%. The number and size of the micropores and the porosity for the microporous PLLA were increased with the increase of silica content, stretching ratio and stretching rate (5 - 20 mm/min), while were reduced with the rise of stretching temperature. The stretching ratio of 2.5 was the key point for pore forming when silica content was under 10 wt%. The porosity was up to 21.1% with the silica content of 20 wt% and stretching ratio of 4.5. The mechanical properties and thermal insulation properties of microporous PLLA were also improved comparing with that of PLLA without pores.

**Keywords:** Poly(L-lactic acid); Nanoscale dispersed silica; Uniaxial stretching; Microporous structure

## 1. Introduction

Biomass-derived poly(L-lactic acid) (PLLA), a thermoplastic aliphatic polyester, is one of the most