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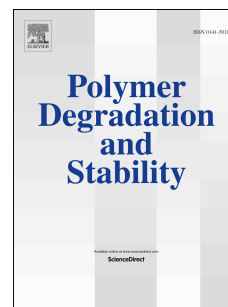
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Study of the alkali lignin stabilization thanks to plasma process*Andrii Zaitsev^{1,2}, Sandy Moisan¹, Fabienne Poncin-Epaillard²*¹*IRT Jules Verne, Chemin du Chaffault, 44340 Bouguenais, France*²*Institut des Molécules et Matériaux du Mans (IMMM), UMR CNRS 6283, Le Mans Université, Avenue Olivier Messiaen, 72085 Le Mans Cedex, France*

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Abstract

The influence of plasma treatment on lignin chemical and physical properties was studied. The screening of the different process parameters (gas chemical nature, flow, pressure and discharge power) shows changes in the glass transition temperature (T_g) of different lignins. Chemical nature of plasma phase has the highest influence. These changes are related to the modulation of the molecular weight of lignin chains (crosslinking or degradation) and were evidenced by differential scanning calorimetry and by dielectric spectroscopy. Treated lignin powder showed better processability by extrusion (lower viscosity) than the pristine one.

I. Introduction

Carbon fiber is a unique material that combines a lot of advantages compared to traditional construction materials such as metals or plastics : high stiffness (> 250 GPa), high tensile strength (> 2.5 GPa), low weight and low thermal expansion. Introduced to the market in early 1960s, they were initially developed from cellulose precursor. Subsequent developments have shown that fibers derived from polyacrylonitrile (PAN) precursor possess better mechanical properties and cellulose-based production decayed. Today, 82 % of CFs are PAN-based, 11 % are pitch-based and only 7 % are cellulose-based. Furthermore, no production, even in pilote scale, of lignin-based CFs exists. However, PAN is synthesized from acrylonitrile, issued from petroleum industry and thus quite expensive nowadays. This fact makes the use of carbon fibers limited to applications where the cost is a secondary issue

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