FURAN MANUFACTURE FROM LIGNOCELLULOSIC MATERIALS BY REACTION IN CATALYZED IONIC LIQUIDS

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INTRODUCTION

Biomass derived furans (5-hydroxymethylfurfural and furfural) have emerged as an important platform chemical for the production of value added chemicals and liquid fuels that are currently obtained from petroleum. Lignocellulosic materials (LCM) are considered a widespread, renewable resource with an enormous potential for the manufacture of products enabling the development of a biobased economy. According to the biorefinery philosophy, LCM are expected to contribute to the development of a competitive bioeconomy as well as to play a key role in the industrial progress and economic growth in the XXI century.

Ionic liquids (ILs) are considered “green chemicals” owing to their physical, chemical, and technological properties. The utilization of ILs in lignocellulose biorefineries is an attractive and versatile possibility, as they can be employed for multiple purposes, for example as a reaction media for furan production, a field where there is a significant room for improvement.

MATERIALS AND METHODS

IL was molten, dried, heated to the target temperature (in the range 140 - 160 °C) and mixed with a catalyst (chromium (III) chloride, aluminium (III) chloride, tangstophosphoric acid and/or combination of various catalysts). Once the catalyst was dissolved, the considered MLC was added to the medium (in the range 2.5 - 10 g MLC/100 g BmimCl) under stirring. Zero time corresponded to substrate addition. At preset reaction times (in the range 1 - 60 min), samples from the reaction media were withdrawn, diluted immediately with distilled water (at a mass ratio of 20 g water/g sample), homogenized, and assayed for composition by HPLC-RI and HPLC-DAD.

RESULTS AND DISCUSSION

The optimal conditions of temperature, time, sustrate/IL ration and catalyst for furan production from MLCs were identified. The maximum HMF conversions achieved were 40.3, 41.2 and 39.4% to corn stover, Eucalyptus globulus and Pinus pinaster, respectively. In case of furfural, the values obtained were 28.1, 18.5 and 39.8%. These experimental data confirmed the potential of the environmentally friendly method to produce furans from corn stover, Eucalyptus globulus and Pinus pinaster, as well as for enabling an integral benefit of the feedstock according to the biorefinery philosophy.