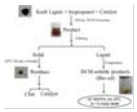


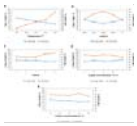


Table 1

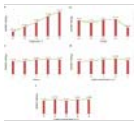
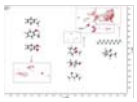


Table 2
Table 3



Bioresource Technology

Volume 212, July 2016, Pages 302–310

High-quality bio-oil from one-pot catalytic hydrocracking of kraft lignin over supported noble metal catalysts in isopropanol system

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Received 25 January 2016, Revised 5 April 2016, Accepted 6 April 2016, Available online 8 April 2016

https://doi.org/10.1016/j.biortech.2016.04.029

Highlights

- High-quality bio-oil was obtained by using isopropanol as the solvent.
- This reaction was thermally controlled after the orthogonal array design analysis.
- The aim of reducing oxygenic-chain compounds was realized over Rh/C.
- Maximum phenol conversion (93.4%) and HHV (37.969 MJ/kg) were observed over Rh/C.
- A possible catalytic hydrocracking pathway was proposed.

Abstract

Catalytic hydrocracking of kraft lignin was carried out in isopropanol system and an orthogonal array design (OAD) was employed to optimize the experimental conditions. GC–MS/FID, elemental analysis, GPC and ^{1}H-^{13}C HSQC NMR were carried out for entire investigation of the liquid products. The results indicated that the hydrocracking process was thermally controlled and catalysts showed significant influences on the product distributions. Comparing with Pd/C, Pt/C and Ru/C, Rh/C inhibited the self-condensation of isopropanol and reduced the formation of oxygenic-chain compounds. The excellent catalytic activity for phenols conversion was obtained over Rh/C. The routes of oxygenic-chain compounds formation and phenol conversion were proposed in detail. The least oxygenic-chain compounds formation, the highest phenols conversion (93.4%), the lowest O/C ratio (0.094) and the highest HHV (37.969 MJ/kg) provided the possibility of the high quality bio-oil obtained over Rh/C in isopropanol medium.

Keywords

Kraft lignin; Isopropanol; Hydrocracking; Orthogonal array design; Nobel metal catalysts

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