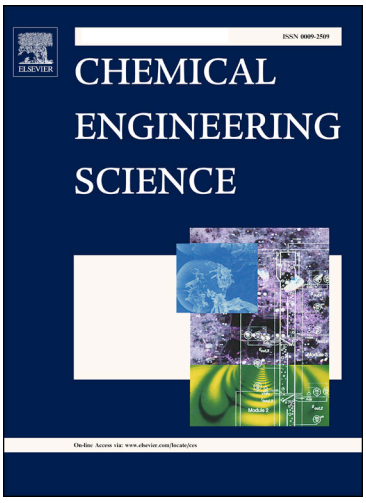


# Hydrodeoxygenation of fast pyrolysis oil with novel activated carbon-supported NiP and CoP catalysts

Cheng Guo, Kasanneni Tirumala Venkateswara Rao, Zhongshun Yuan, Sophia (Quan) He, Sohrab Rohani, Chunbao (Charles) Xu

PII: S0009-2509(17)30785-6
DOI: https://doi.org/10.1016/j.ces.2017.12.048
Reference: CES 13983

To appear in: *Chemical Engineering Science*

Received Date: 13 September 2017
Revised Date: 23 November 2017
Accepted Date: 22 December 2017

Please cite this article as: C. Guo, K. Tirumala Venkateswara Rao, Z. Yuan, S. (Quan) He, S. Rohani, C. (Charles) Xu, Hydrodeoxygenation of fast pyrolysis oil with novel activated carbon-supported NiP and CoP catalysts, *Chemical Engineering Science* (2017), doi: https://doi.org/10.1016/j.ces.2017.12.048

# Hydrodeoxygenation of fast pyrolysis oil with novel activated carbon-supported NiP and CoP catalysts

Cheng Guo[a], Kasanneni Tirumala Venkateswara Rao[a], Zhongshun Yuan[a], Sophia (Quan) He[b], Sohrab Rohani[a]*, Chunbao (Charles) Xu[a]*

[a]*Institute for Chemicals and Fuels from Alternative Resources (ICFAR), Department of Chemical & Biochemical Eng., Western University, London, ON, N6A 5B9, Canada*

[b]*Department of Engineering, Faculty of Agriculture, Dalhousie University, Truro, Nova Scotia, B2N 5E3, Canada*

**Corresponding authors: Email: srohani@uwo.ca (S. Rohani); cxu6@uwo.ca (C. Xu)*

## Abstract

Catalytic hydrodeoxygenation (HDO) has been considered as a promising technical route to upgrade fast pyrolysis oil to liquid transportation fuels. In this work, a series of active and inexpensive catalysts were synthesized for bio-oil HDO, i.e., activated carbon (AC)-supported nickel phosphide and cobalt phosphide catalysts, with a metal/P molar ratio varying from 5/2, 3/2, 1/1, 1/2, 1/3. For comparison, AC-support pure metal catalysts without P were also prepared. Effects of phosphorus content on HDO performance of the catalysts were investigated on a 100 mL bench-scale reactor system using a wood-derived pyrolysis oil at 300 °C and initial hydrogen pressure of 50 bar for 3 h. The results showed that the properties of the upgraded bio-oils were greatly affected by the phosphorus content in both Ni and Co catalysts. The best performance seemed to be achieved with the catalysts at a metal/P molar ratio of about 3/2. Moreover, 0.5 wt% of Ru was further added to the catalysts at a metal/P molar ratio of 3/2 and to the pure metal