

## Supplementary Information

For

### LiCoO<sub>2</sub> impregnated nano hierarchical HZSM-5 assisted catalytic upgrading of Kraft lignin derived liquefaction bio-oil

Ashutosh Agarwal<sup>1,2\*</sup>, Xue Li<sup>3\*\*</sup>

<sup>1</sup>Department of Environment and Energy Engineering, Chonnam National University, Gwangju  
61186, Republic of Korea

<sup>2</sup>Engineering Product Development, Singapore University of Technology and Design, 8 Somapah  
Road, 487372, Singapore

<sup>3</sup>Department of Materials Science and Engineering, Luoyang Institute of Science and Technology,  
Louyang, 471023, P.R. China

\*E-mail: ashutosh\_agarwal@sutd.edu.sg; \*  0000-0002-3007-1091

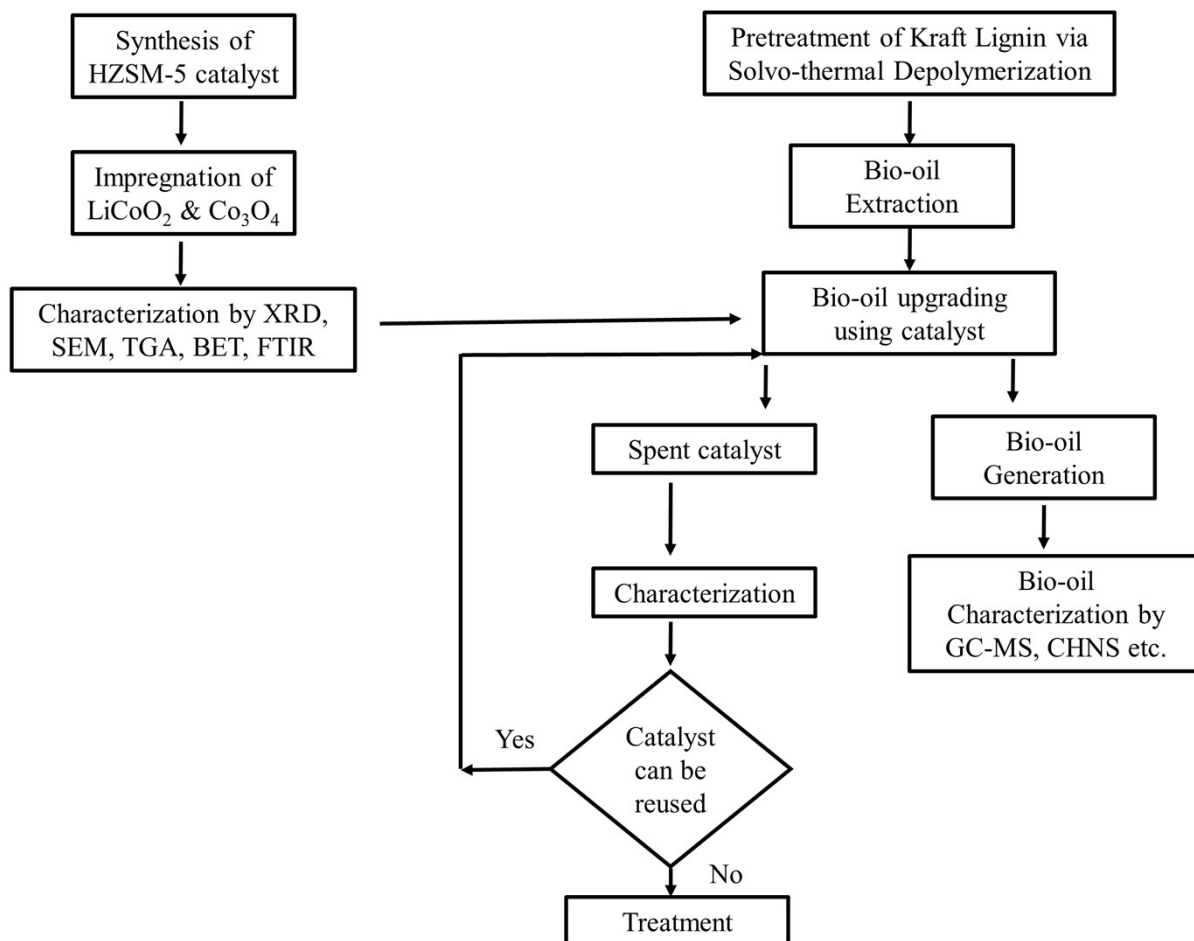
\*\*E-mail: lixue0377@lit.edu.cn

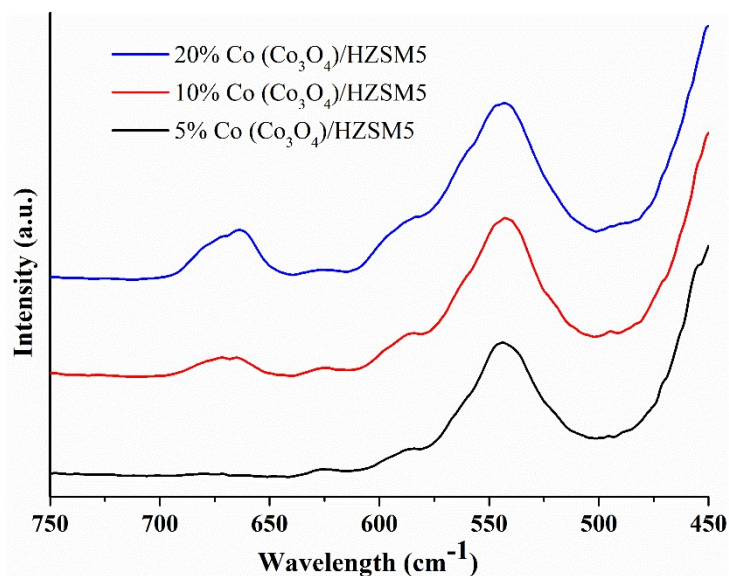
**Table S1.** Actual metal contents of all the synthesized LiCoO<sub>2</sub> and Co<sub>3</sub>O<sub>4</sub> loaded HZSM--5 catalysts.

Catalysts	Li (wt %)	Co (wt %)
5% Co (LiCoO <sub>2</sub> )/HZSM-5	0.57	4.81
10% Co (LiCoO <sub>2</sub> )/HZSM-5	1.06	9.63
20% Co (LiCoO <sub>2</sub> )/HZSM-5	2.27	19.22
5% Co (Co <sub>3</sub> O <sub>4</sub> )/HZSM-5	-	4.85
10% Co (Co <sub>3</sub> O <sub>4</sub> )/HZSM-5	-	9.74
20% Co (Co <sub>3</sub> O <sub>4</sub> )/HZSM-5	-	19.38

**Figure S1** Schematic illustration of the experimental procedure.

### Schematic of the Experimental Procedure





**Figure S2.** FTIR absorption spectra of all the synthesized Co<sub>3</sub>O<sub>4</sub>/HZSM-5 catalysts.

**Figure S3.** FTIR absorption spectra of all the synthesized LiCoO<sub>2</sub>/HZSM-5 catalysts.

