## **Supplementary Information**

For

## LiCoO<sub>2</sub> impregnated nano hierarchical HZSM-5 assisted catalytic upgrading of Kraft

lignin derived liquefaction bio-oil

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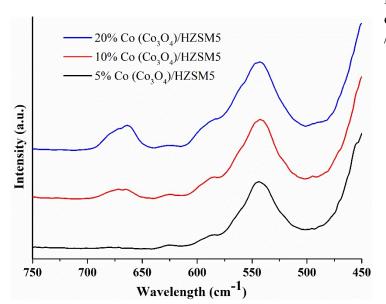
**Table S1.** Actual metal contents of all the synthesized LiCoO<sub>2</sub> and Co<sub>3</sub>O<sub>4</sub> loaded HZSM--5 catalysts.

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.

## Pretreatment of Kraft Lignin via Synthesis of Solvo-thermal Depolymerization HZSM-5 catalyst Bio-oil Impregnation of Extraction LiCoO<sub>2</sub> & Co<sub>3</sub>O<sub>4</sub> Bio-oil upgrading Characterization by XRD, using catalyst SEM, TGA, BET, FTIR Bio-oil Spent catalyst Generation Bio-oil Characterization Characterization by GC-MS, CHNS etc. Catalyst Yes can be reused No Treatment

## **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.

