

Supplementary Materials: The ZSM-5-Catalyzed Oxidation of Benzene to Phenol with N₂O: Effect of Lewis Acid Sites

Cui Ouyang, Yingxia Li and Jianwei Li

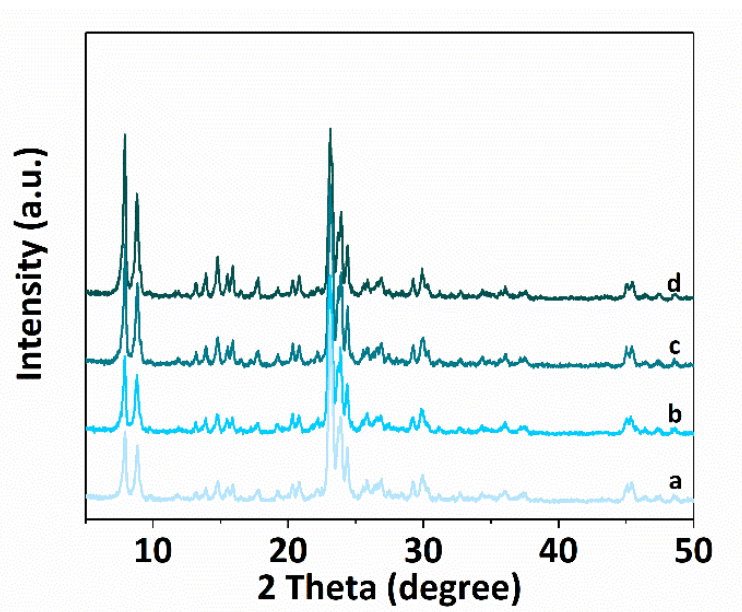


Figure. S1. XRD patterns of (a) H-ZSM-5-773, (b) H-ZSM-5-873, (c) H-ZSM-5-973 and (d) H-ZSM-5-1073.

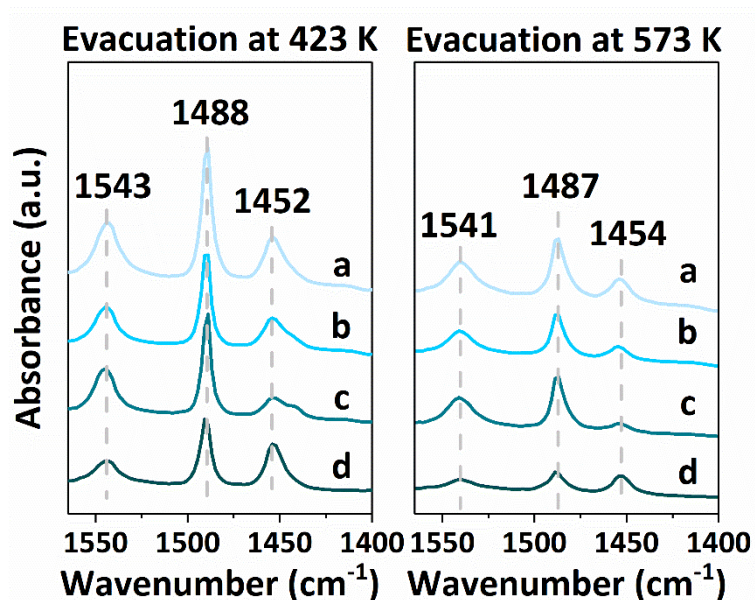


Figure. S2. Pyridine FT-IR spectra on (a) H-ZSM-5-773, (b) H-ZSM-5-873, (c) H-ZSM-5-973 and (d) H-ZSM-5-1073.

Table S1. Acidity properties from Py-IR analysis for catalysts H-ZSM-5-773, H-ZSM-5-873, H-ZSM-5-973 and H-ZSM-5-1073.

Samples	423 K(total) (mmol g ⁻¹)		B/L	573 K(strong) (mmol g ⁻¹)		B/L
	Brønsted ^a	Lewis ^a		Brønsted	Lewis	
H-ZSM-5-773	0.17	0.06	2.83	0.12	0.01	12.00
H-ZSM-5-873	0.14	0.07	2.00	0.12	0.02	6.00
H-ZSM-5-973	0.11	0.09	1.22	0.08	0.03	2.67
H-ZSM-5-1073	0.08	0.09	0.89	0.04	0.04	1.00

^a Determined by FTIR spectra of absorbed pyridine.**Table S2.** Benzene oxidation to phenol with N₂O after 20min of the reaction.

Samples	N ₂ O selectivity to phenol (%)	LAS
H-ZSM-5-773	74.2	0.056
H-ZSM-5-873	70.3	0.067
H-ZSM-5-973	60.8	0.088
H-ZSM-5-1073	58.9	0.092

Table S3. Carbon calculation in the outlet flow after 3 h reaction time for samples.

sample	The ratio between the carbon in the outlet flow to the inlet flow ^a / %	Coke ^b / %
H-ZSM-5	78	22
Fe-ZSM-5	74	26
H-ZSM-5-ST	82	18
Fe-ZSM-5-ST	87	13
H-ZSM-5-773	74	26
H-ZSM-5-873	74	26
H-ZSM-5-973	72	28
H-ZSM-5-1073	72	28

^a the amount of products such as CO and CO₂ were ignored as their marginally moles^b coke = (1-the ratio between the carbon in the outlet flow to the inlet flow)100%