Supporting Information for

Carbon wrapped Fe-Ni bimetallic nanoparticles catalyzed Friedel-Crafts acylation toward green synthesis of aromatic ketones

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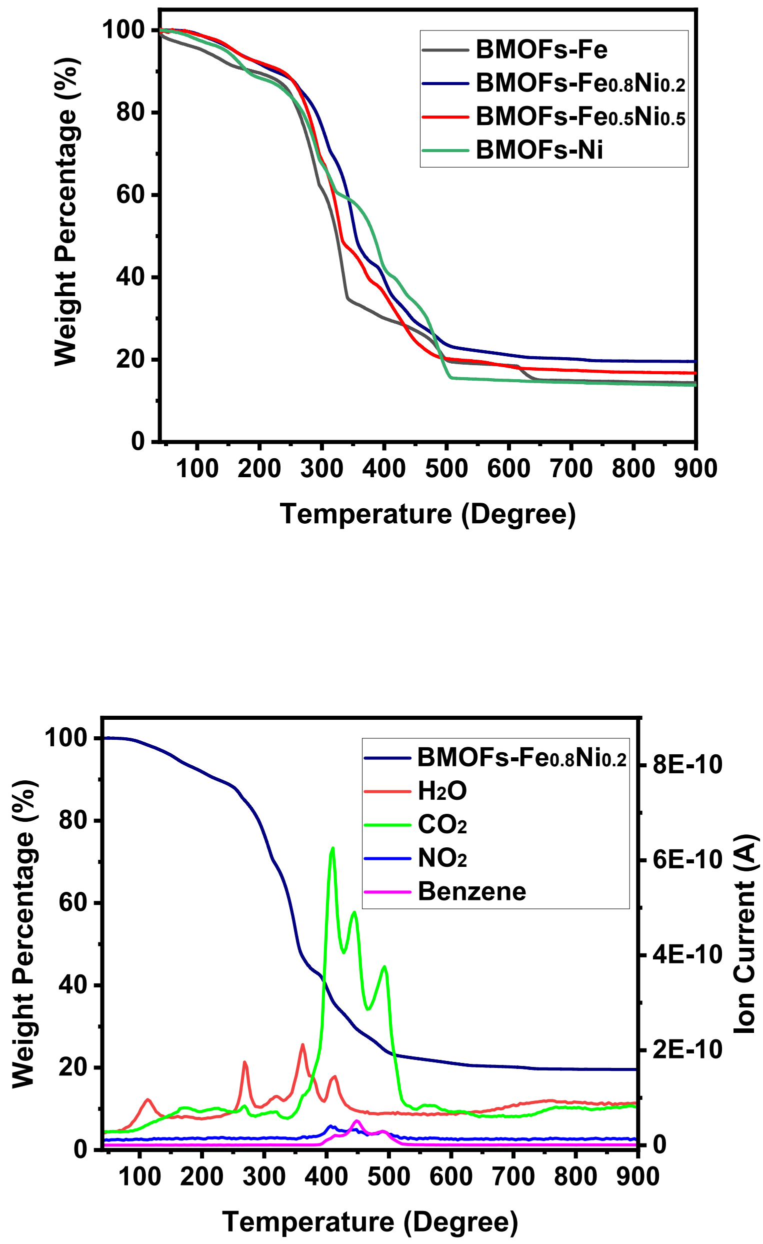
(a)



(b)

Figure S1. The TG profiles of the BMOFs-Fe_xNi_{1-x} (a) and the TG-MS profiles of the BMOFs-$Fe_{0.8}Ni_{0.2}$ (b) under an inert atmosphere.

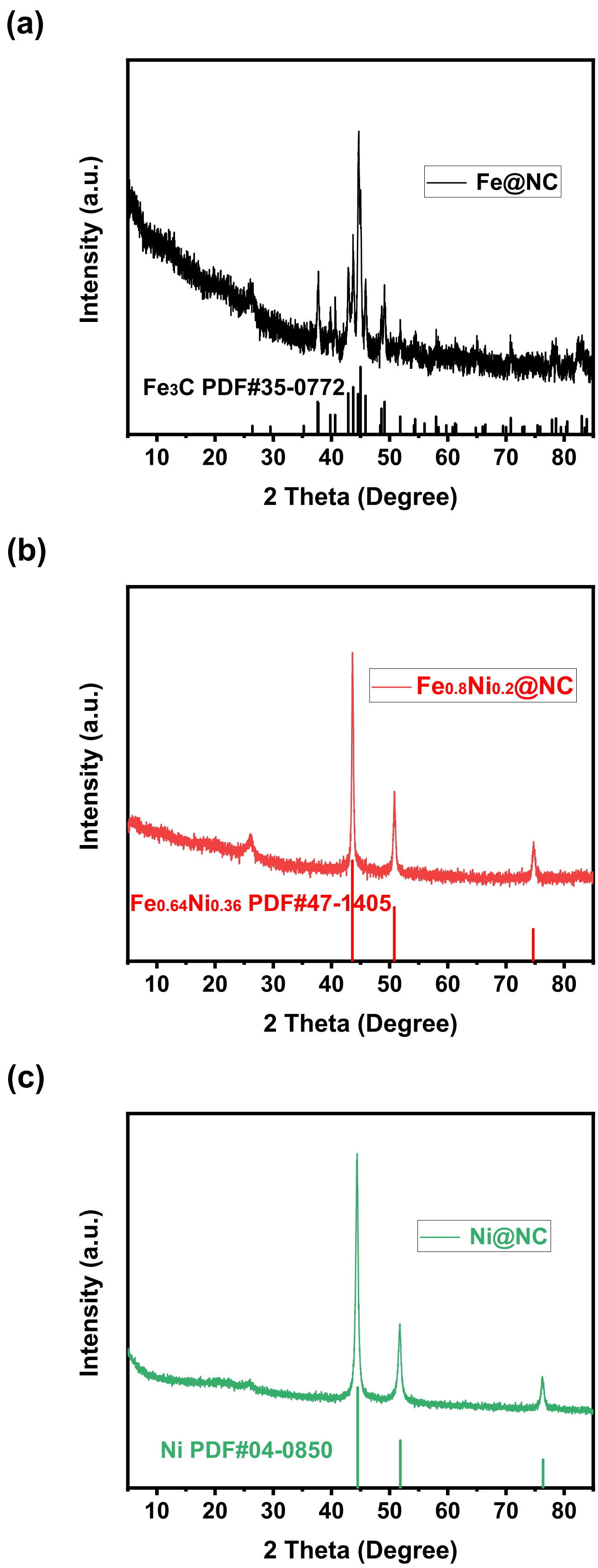


Figure S2. XRD patterns of (a) Fe@NC, (b) $Fe_{0.8}Ni_{0.2}$@NC, (c) Ni@NC, respectively.

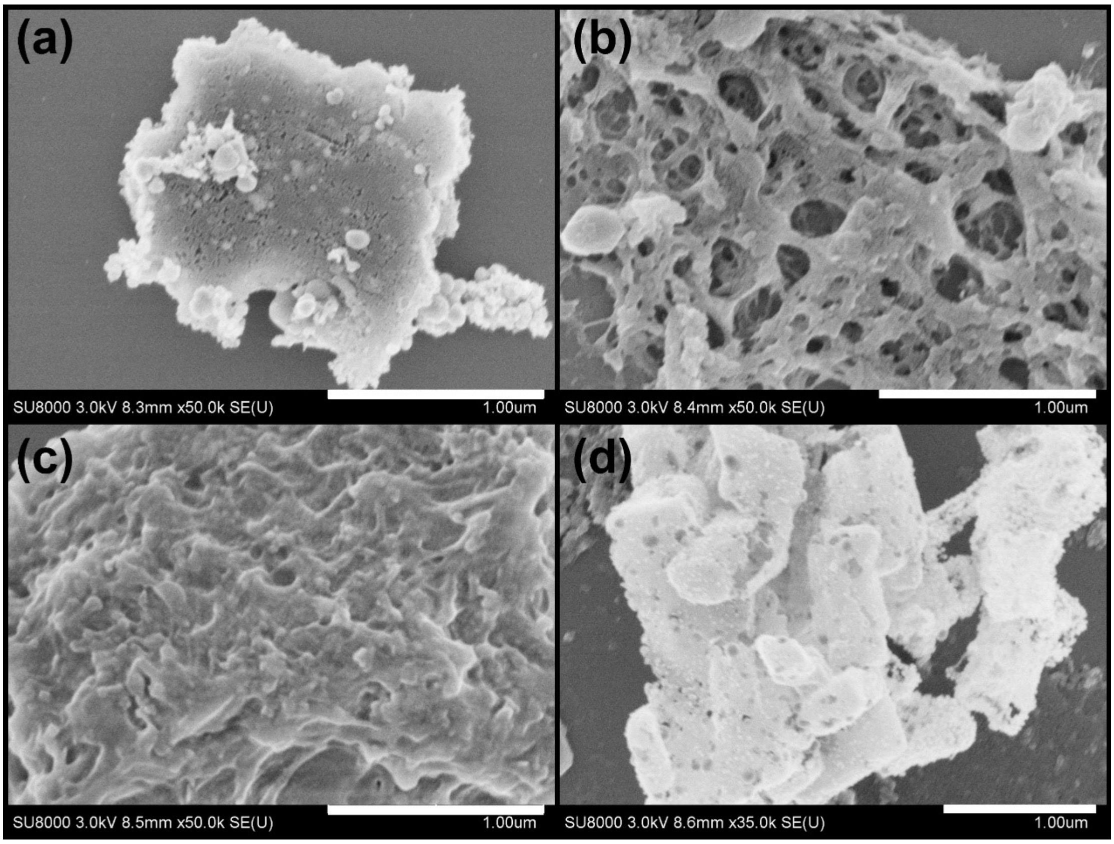


Figure S3. SEM images of (a) Fe@NC, (b) $Fe_{0.8}Ni_{0.2}$@NC, (c) $Fe_{0.5}Ni_{0.5}$ and (d) Ni@NC. The bar in SEM images represents the 1 um scale.

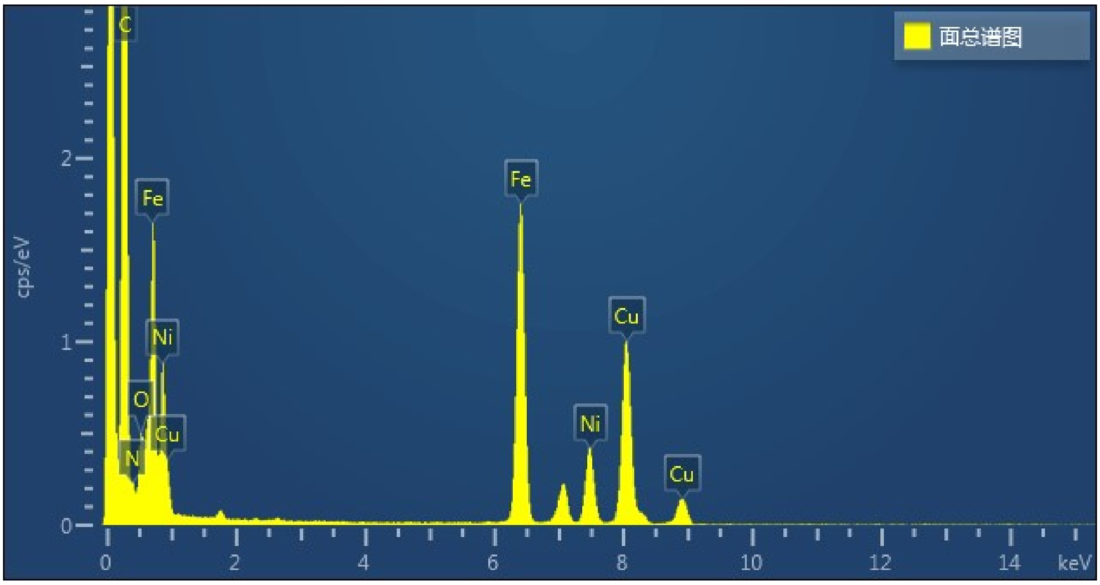


Figure S4. EDS spectra of $Fe_{0.8}Ni_{0.2}$@NC.

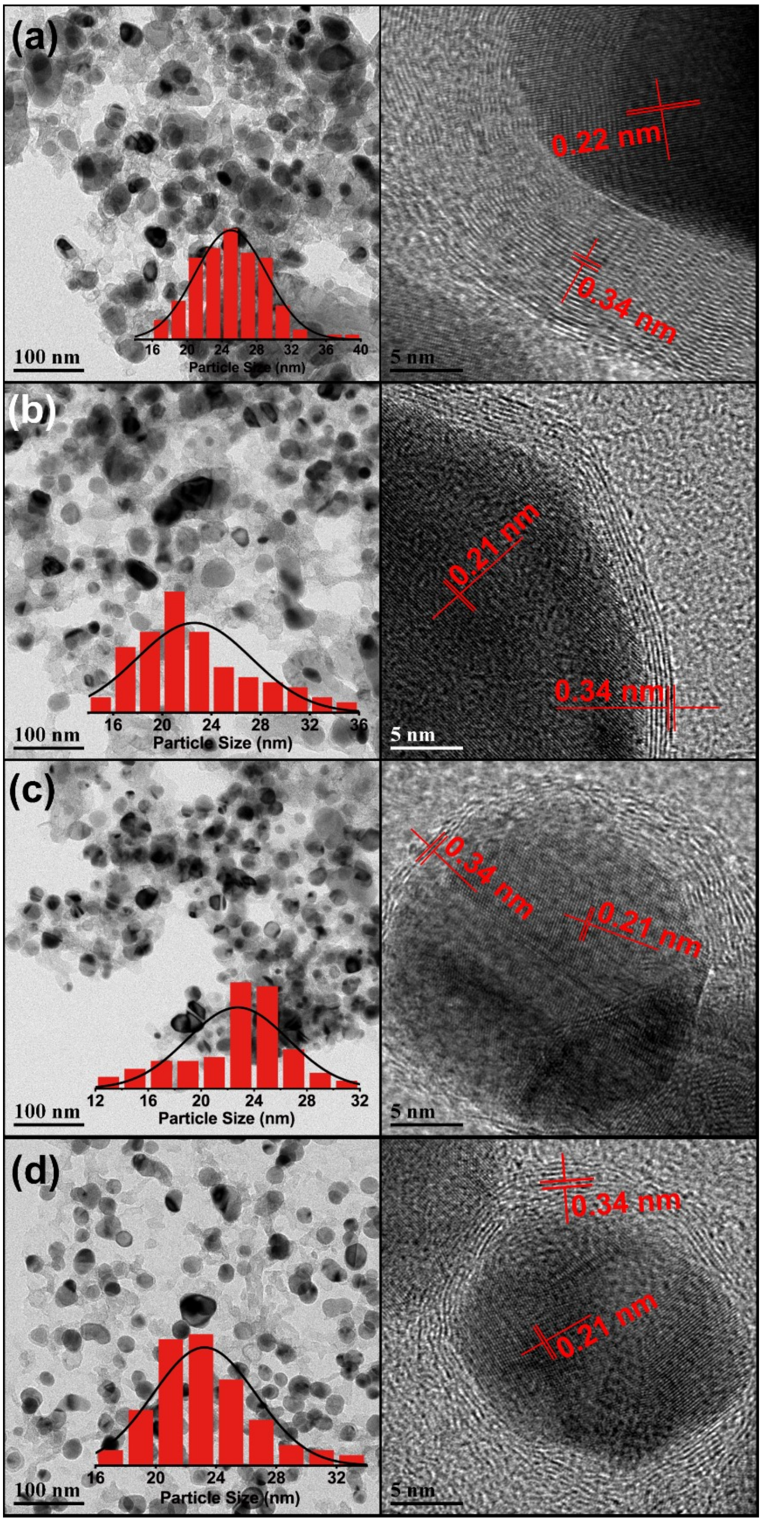


Figure S5. TEM and HRTEM images of (a) Fe@NC, (b) $Fe_{0.9}Ni_{0.1}$@NC, (c) $Fe_{0.5}Ni_{0.5}$@NC and (d) Ni@NC. The inset in TEM is the statistical analysis on the particle size.

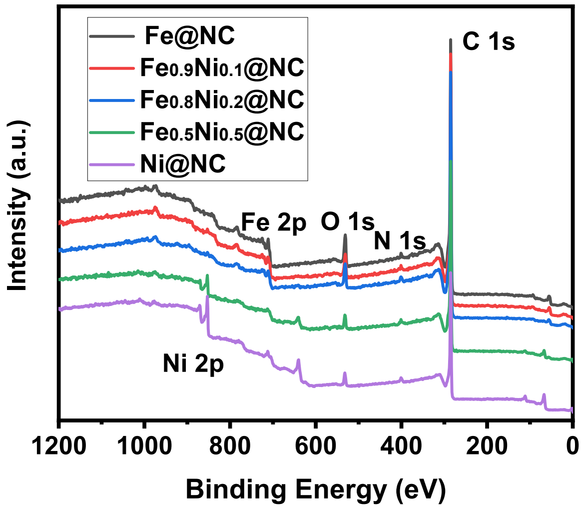


Figure S6. XPS survey spectra of Fe_xNi_{1-x}@NC catalysts.

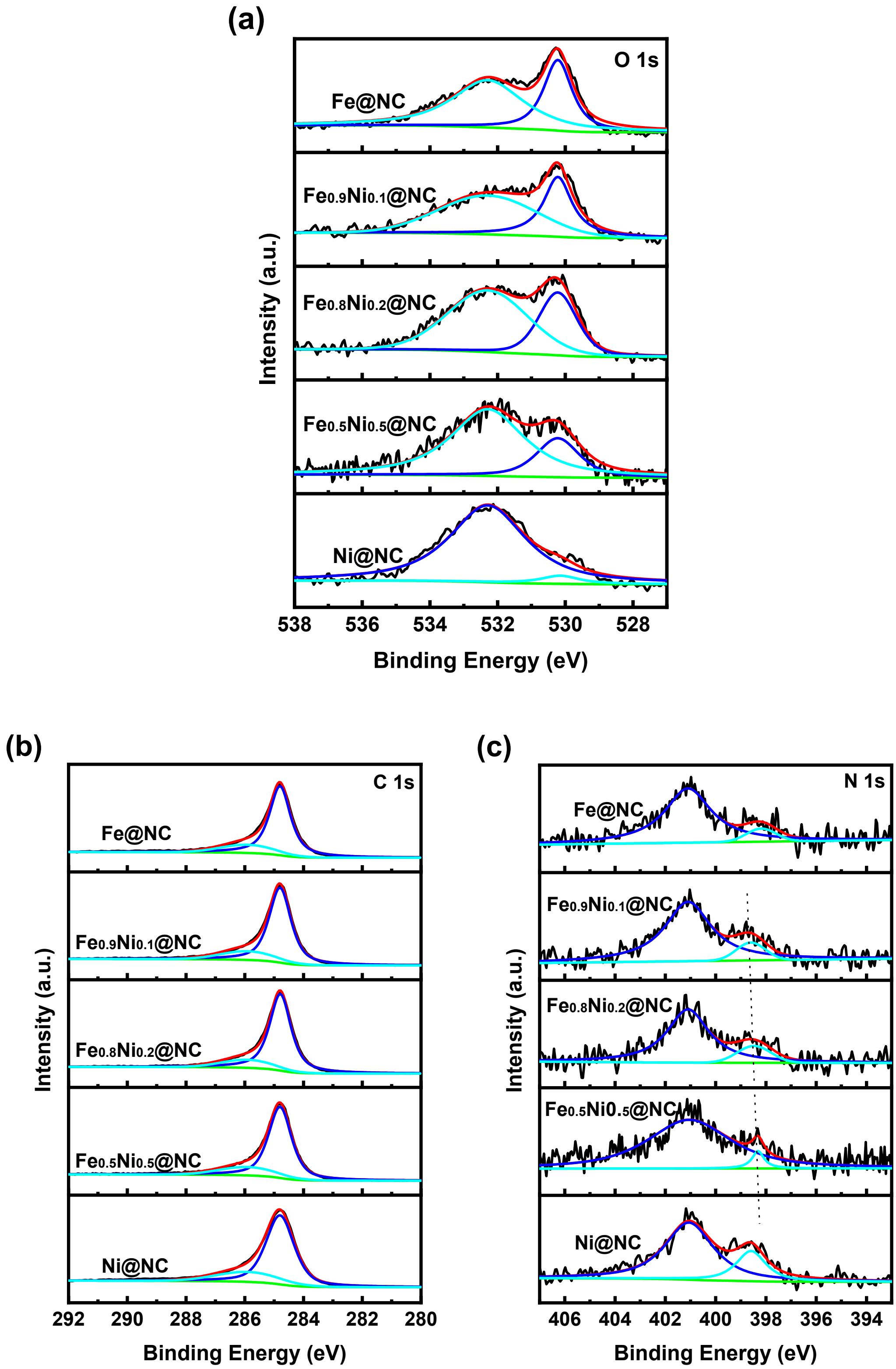


Figure S7. XPS profiles for the binding energies of (a) O 1s, (b) C 1s and (c) N 1s for Fe_xNi_{1-x}@NC catalysts.

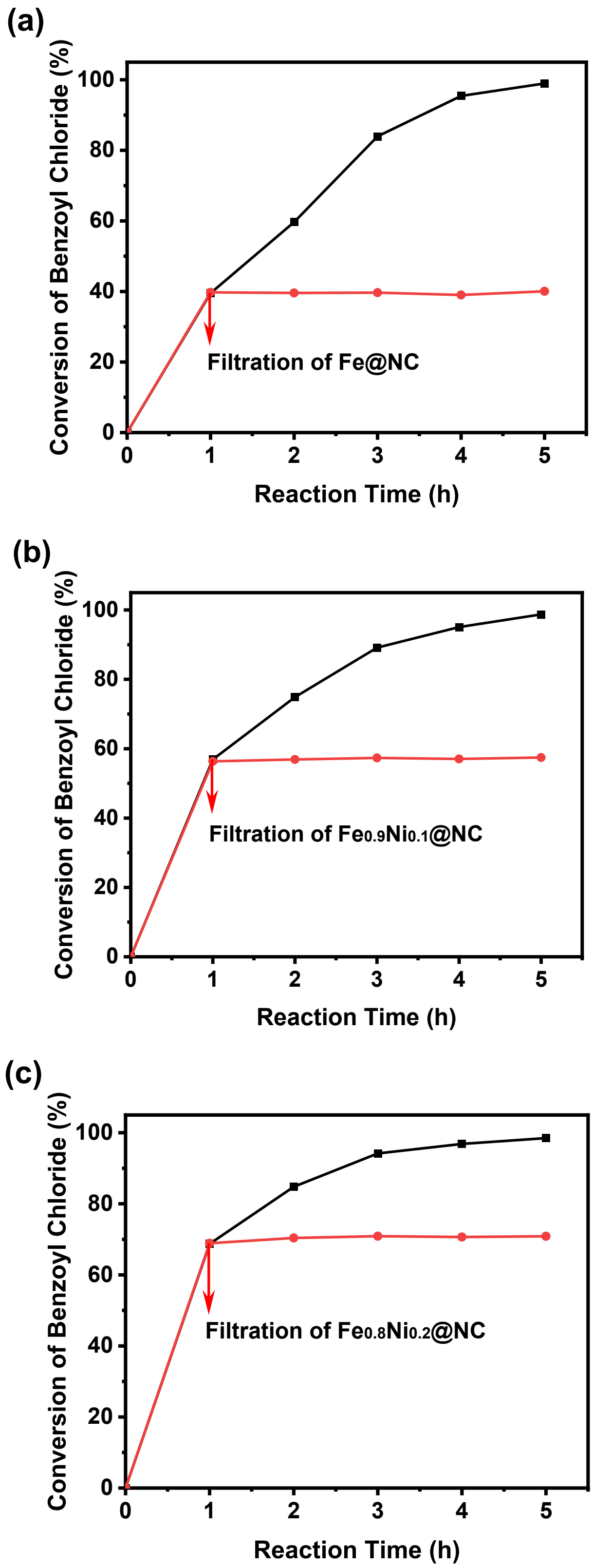


Figure S8. Time-course and leaching tests of Fe_xNi_{1-x}@NC catalysts. Reaction conditions: 130 °C reaction temperature, 20 mmol m-xylene, 10 mmol benzoyl chloride, 10 mmol dodecane, 50 mg catalyst.

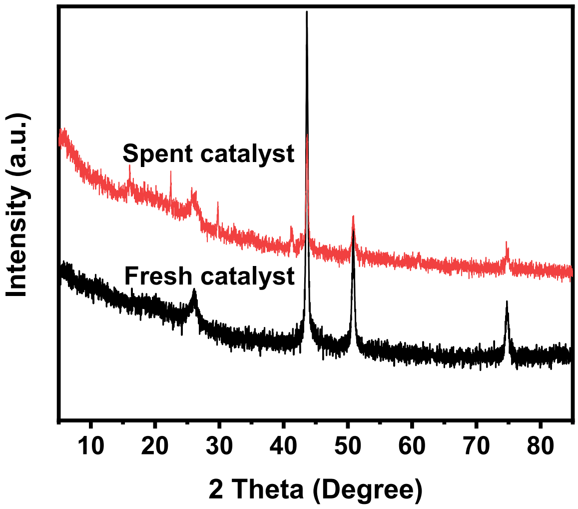


Figure S9. XRD diffraction patterns of fresh and used $Fe_{0.8}Ni_{0.2}$@NC catalysts after several consecutive cycles.

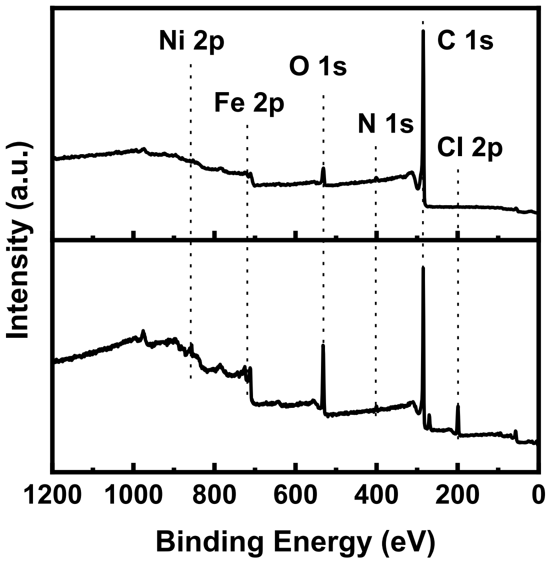


Figure S10. XPS survey spectra of the fresh (upper) and spent (down) $Fe_{0.8}Ni_{0.2}$@NC catalysts.

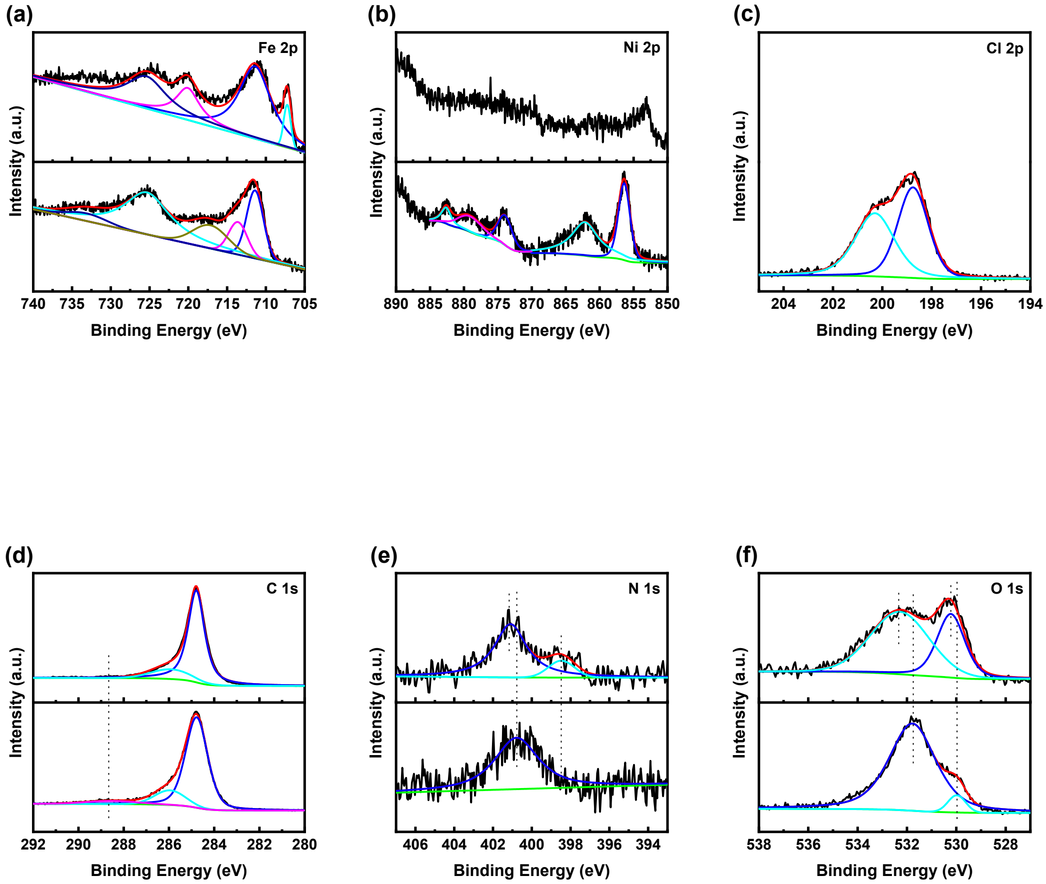


Figure S11. XPS survey spectra of Fe 2p (a), Ni 2p (b), Cl 2p (c), C 1s (d), N 1s (e) and O 1s (f) of the fresh (upper) and the spent (down) catalyst of $Fe_{0.8}Ni_{0.2}$@NC.

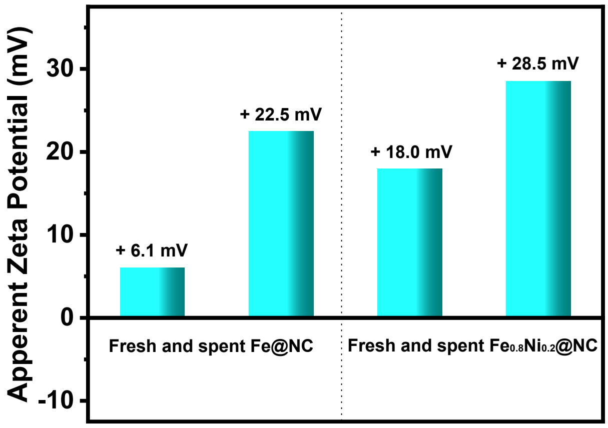


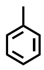
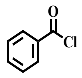
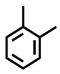
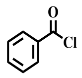
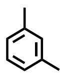
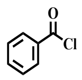
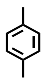
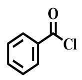
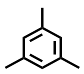
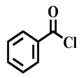
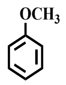
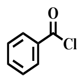
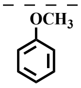
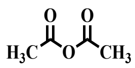
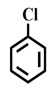
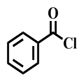
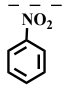
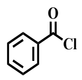
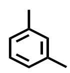
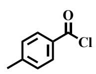
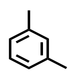
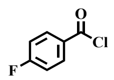
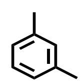
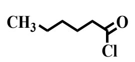
Figure S12. Zeta-potential of fresh and spent Fe@NC and $Fe_{0.8}Ni_{0.2}$@NC catalysts.

Table S1. The elemental contents on the surface of Fe_xNi_{1-x}@NC obtained from XPS analysis.

Samples	Elemental composition (At. %)					
	C	N	O	Fe	Ni	Cl
Fe@NC	89.73	1.50	6.98	1.79	-	-
$Fe_{0.9}Ni_{0.1}$@NC	90.80	1.92	5.52	1.63	0.13	-
$Fe_{0.8}Ni_{0.2}$@NC	90.64	1.73	6.01	1.27	0.35	-
$Fe_{0.5}Ni_{0.5}$@NC	91.34	1.83	4.48	0.93	1.42	-
Ni@NC	87.41	2.65	5.50	-	4.44	-
$Fe_{0.8}Ni_{0.2}$@NC*	68.59	1.85	16.59	5.20	1.56	6.21

*The recycled catalyst of $Fe_{0.8}Ni_{0.2}$@NC after Friedel-Crafts acylation reactions.

Table S2. Influence of various substrates or acylation reagents on Fe@NC and $Fe_{0.8}Ni_{0.2}$@NC catalyzed Friedel-Crafts acylation reaction[a].

Entry	Substrate	Acylation reagent	Time/h	Fe@NC		$Fe_{0.8}Ni_{0.2}$@NC	
				Con.[b]/%	Yield[c]/%	Con.[b]/%	Yield[c]/%
1			1	4	4	15	12
			5	62	49	71	56
2			1	36	29	51	40
			5	83	63	83	64
3			1	40	38	69	66
			5	99	95	99	95
4			1	29	29	48	48
			5	73	73	87	87
5			1	70	70 `	94	94
6			1	56	51	70	66
			3	59	53	80	76
7			5	0	0	0	0
8			5	0	0	0	0
9			5	0	0	0	0
10			1	41	40	43	41
			5	84	81	93	89
11			1	15	14	37	36
			5	71	68	88	86
12			1	18	13	28	21
			5	26	19	58	41

[a] Reaction conditions: temperature = 130 °C, catalyst dose = 0.05 g, $n_{(substrate)}/n_{(acylation\ reagent)}$ = 2:1. [b] Conversion of the acylation reagent. [c] Yield of the main product.