

Highly Dispersed Co Nanoparticles Embedded in Carbon Matrix as Robust and Efficient Fischer-Tropsch Synthesis Catalyst Under Harsh Condition

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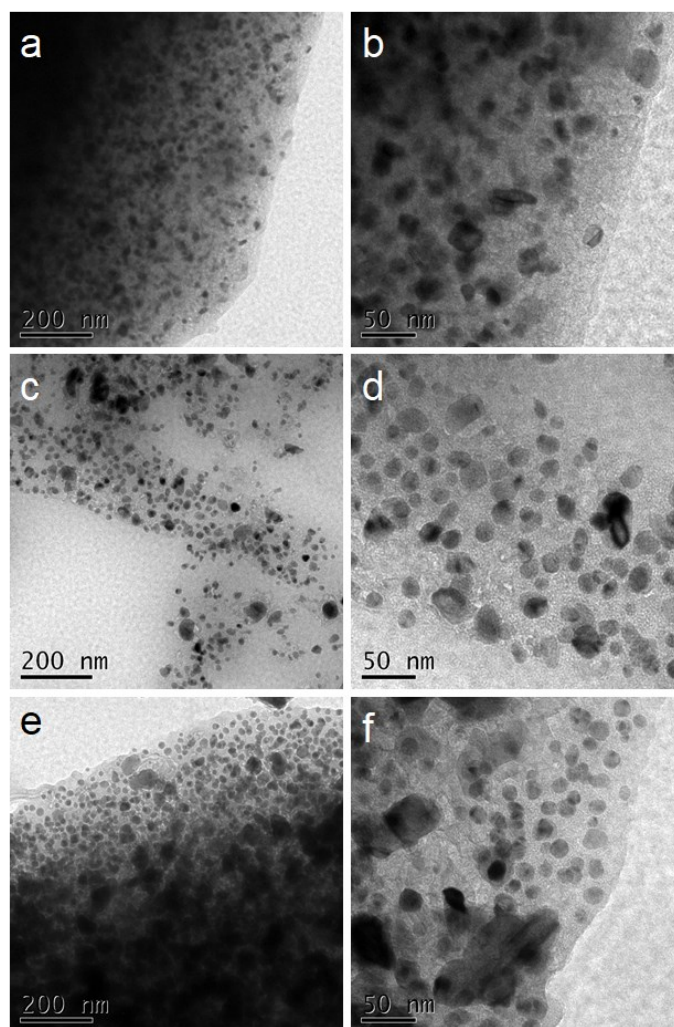


Figure S1 TEM of different Co@C catalysts. a and b: 20-Co@C; c and d: 50-Co@C; e and f: 65-Co@C

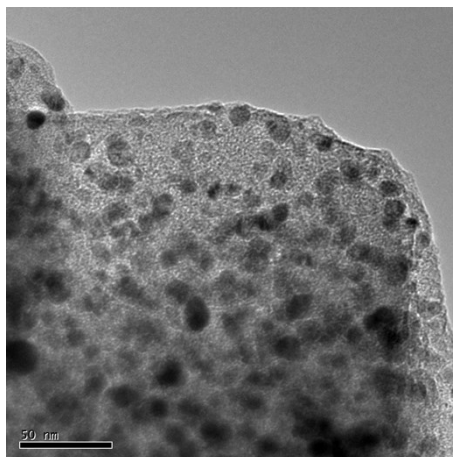


Figure S2 The typical TEM image of MOFs derived Co@C catalyst (Co@C-M).

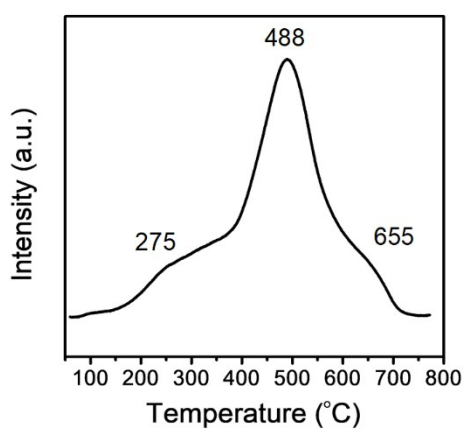


Figure S3 TPR patterns of Co@C-M catalyst.

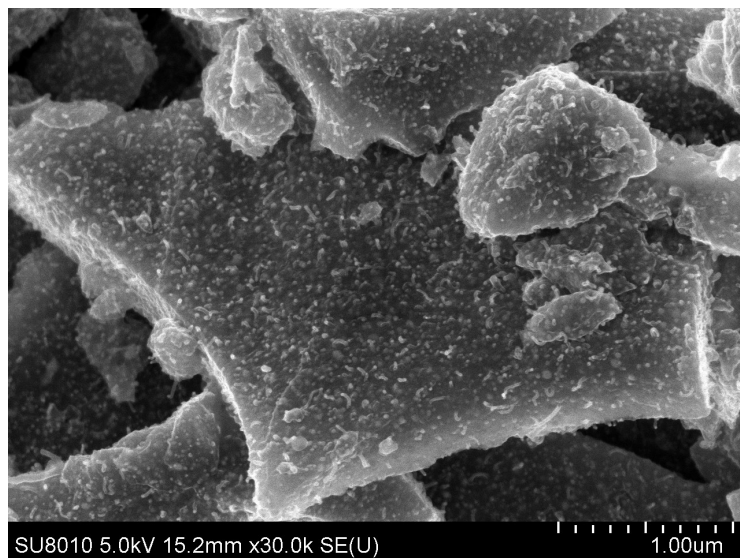


Figure S4 SEM image of 35-Co@C sample.

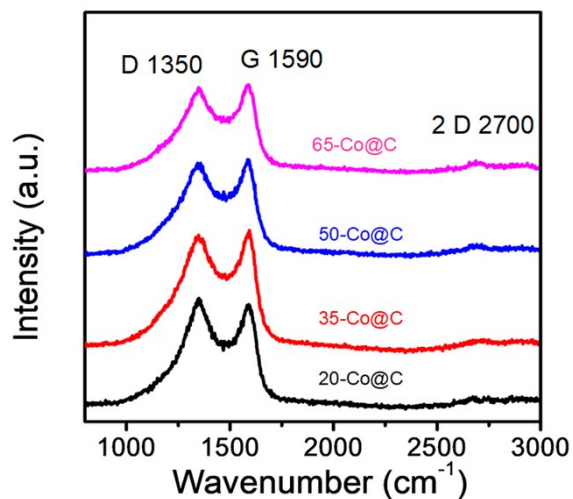


Figure S5 Raman spectrum of different Co@C catalysts.

Table S1 TG results of different Co catalysts

Catalyst	Weight Loss (%)	Residual Co ₃ O ₄ ^a (%)	Co Loading (%)
20-Co@C	72.0	28.0	20.6
35-Co@C	61.1	38.9	28.6
50-Co@C	43.1	56.9	41.8
65-Co@C	40.1	59.9	44.0

a: Co₃O₄ was assumed as the unique Co species after a 900 °C TG experiment.

Table S2 Surface compositions of Co@C samples with different Co loading by XPS analysis

Catalyst	Co	C	O	Co/C
20-Co@C	0.7	89.0	10.3	0.07
35-Co@C	1.6	92.4	6.0	0.27
50-Co@C	1.6	88.4	10.0	0.16
65-Co@C	2.6	89.2	8.1	0.32
35-Co@C ^a	5.1	77.5	16.4	0.31

a: Treated in pure H₂ at 450 °C for 10 h before tested.

Table S3 Catalytic performance of various Co@C catalysts at 260 °C.

Catalysts	CO Conv. (%)	CO ₂ Sel. (%)	Hydrocarbon selectivity (%)		
			CH ₄	C ₂ -C ₄	C ₅ ⁺
20-Co@C	44.3	4.5	26.6	18.7	54.7
35-Co@C	48.7	3.8	27.3	19.5	53.2
50-Co@C	45.3	3.3	25.4	19.8	54.8
65-Co@C	57.5	4.2	27.7	21.5	50.8

CO steady state conversion and hydrocarbon selectivity are collected at 15–40 h.

Table S4 H₂ -TPD data and TOF value of the Co@C catalysts.

Catalyst	H ₂ desorbed ($\mu\text{mol g}^{-1}$)	Dispersity (%)	TOF ($10^{-3}\cdot\text{s}^{-1}$)
20-Co@C	232.2	6.84	6.1
35-Co@C	299.0	5.03	6.5
50-Co@C	219.1	2.58	8.6
65-Co@C	252.8	2.29	9.6