

Electronic Supporting Information for:

Crossed Ferric Oxide Nanosheets Supported Cobalt Oxide on 3-Dimensional Macroporous Ni Foam Substrate Used for Diesel Soot Elimination under Self-Capture Contact Mode

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Table S1 The relative contents of different Co species in the xCo/Fe-NF catalyst obtained by the linear combination fitting of XANES spectra.

Catalysts	CoFe ₂ O ₄ (%)	Co ₃ O ₄ (%)
0.3CoFe/NF	100	0
0.6CoFe/NF	65.9	34.1
0.9CoFe/NF	25.6	74.4

Table S2 T_{10} and T_{50} temperatures corresponding to 10% and 50% soot conversion, and the CO₂ selectivity (S_{CO_2}) during soot combustion over different catalysts, and their specific surface area (S_{BET}).

Catalysts	T_{10} (°C)	T_{50} (°C)	S_{CO_2} (%)	BET(m ² /g)
blank	469	553	50.3	-
Ni foam	389	477	95.02	58
Fe-NF	358	409	94.33	120
0.3Co/Fe-NF	329	399	97.44	118
0.6Co/Fe-NF	320	382	97.77	110
0.9Co/Fe-NF	340	406	97.35	98

Table S3 The reaction rate, active oxygen (O*) density, and TOF of the O* site for soot combustion at 330 °C over different catalysts.

Catalysts	v (mol s ⁻¹ g ⁻¹ × 10 ⁻⁷) ^a	v^* (mol s ⁻¹ g ⁻¹ m ⁻² × 10 ⁻⁹) ^b	O* amount (mol g ⁻¹ × 10 ⁻⁵) ^c		
Fe-NF	1.27	1.05	9.50	0.47	1.34
0.3Co/Fe-NF	1.48	1.31	10.84	0.58	1.36
0.6Co/Fe-NF	2.88	2.60	18.96	1.04	1.52
0.9Co/Fe-NF	2.44	2.48	16.57	1.04	1.47

^a: Reaction rate; ^b: The specific reaction rate unit BET surface area; ^c: The number of active redox sites; ^d: The density of active redox sites; ^e: Turnover frequency defined as the ratio of the reaction rate to the active site density

Table S4 The O1s binding energies (BE), the ratios of different kinds of surface oxygen species.

Catalysts	BE of O 1s (eV)	Percentages (%)
Ni foam	529.0 ^a / (530.7 ^b , 532.4 ^b)	0.39 ^b /0.61 ^a
Fe-NF	529.5 ^a / (530.6 ^b , 532.2 ^b)	0.41 ^b /0.59 ^a
0.3Co/Fe-NF	529.4 ^a / (530.2 ^b , 532.0 ^b)	0.47 ^b /0.53 ^a
0.6Co/Fe-NF	529.0 ^a / (530.6 ^b , 532.5 ^b)	0.54 ^b /0.46 ^a
0.9Co/Fe-NF	529.2 ^a / (530.6 ^b , 532.5 ^b)	0.43 ^b /0.57 ^a

^a: Surface lattice oxygen; ^b: Surface-adsorbed oxygen;

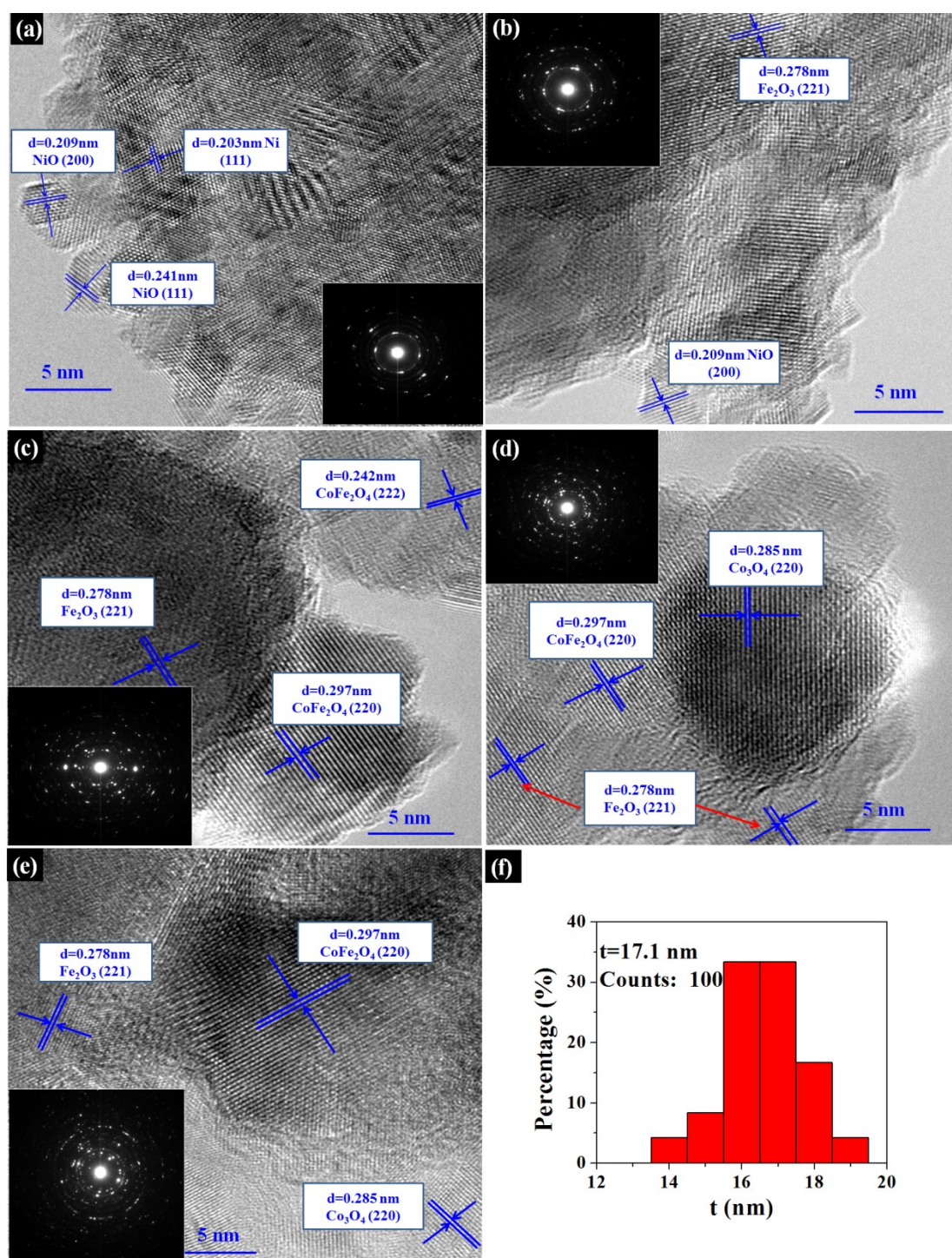


Fig. S1 The HRTEM and SAED characterizations on the samples: (a) Ni foam, (b) Fe-NF, (c) 0.3Co/Fe-NF, (d) 0.6Co/Fe-NF and (e) 0.9Co/Fe-NF; and the size distribution of the Fe-NF sample (f) determined by Fig. 3(c)..

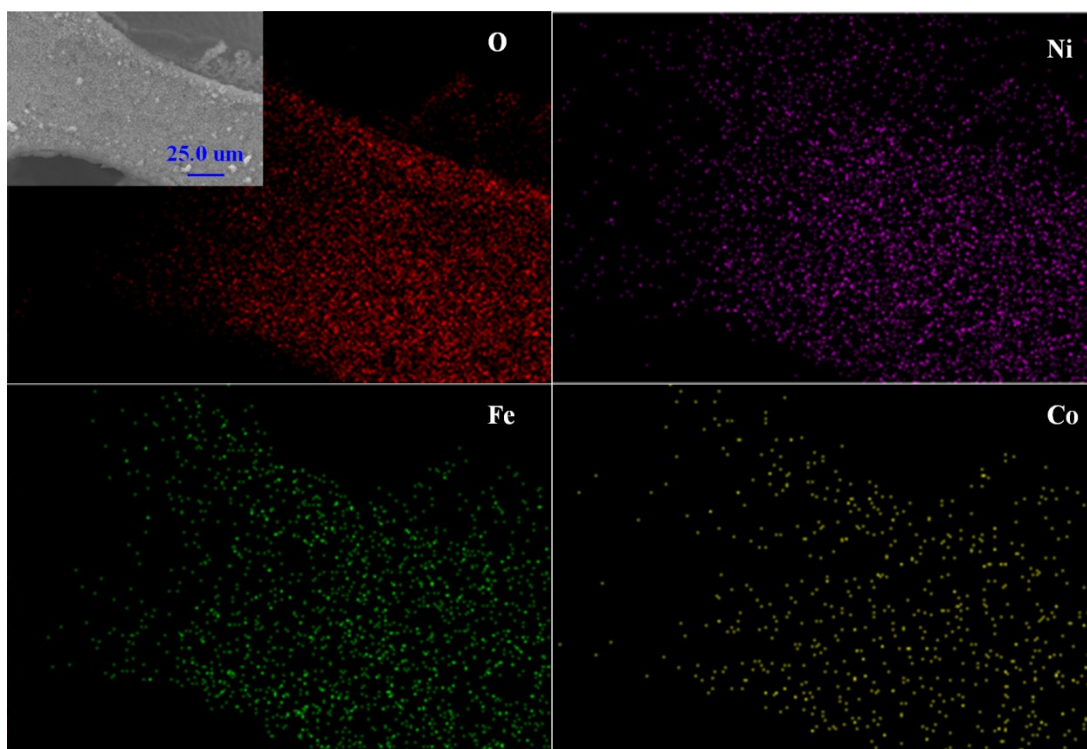


Fig. S2 The EDS mapping images of the 0.6Co/Fe-NF catalyst.

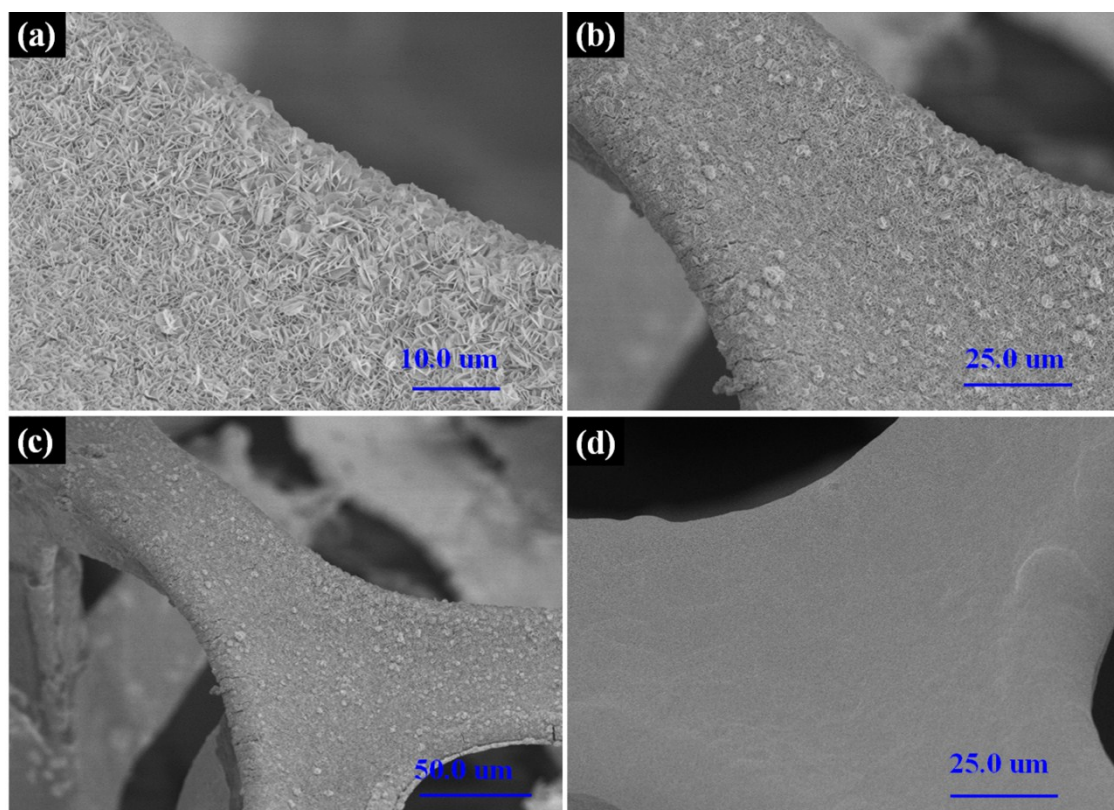
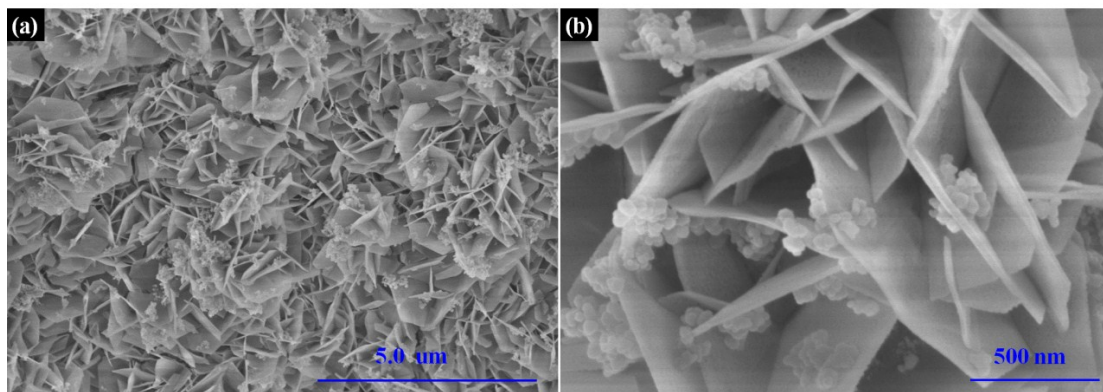


Fig. S3 The SEM images of the 0.6Co/Fe-NF catalyst in different size (a-c) and reference sample Ni foam (d).



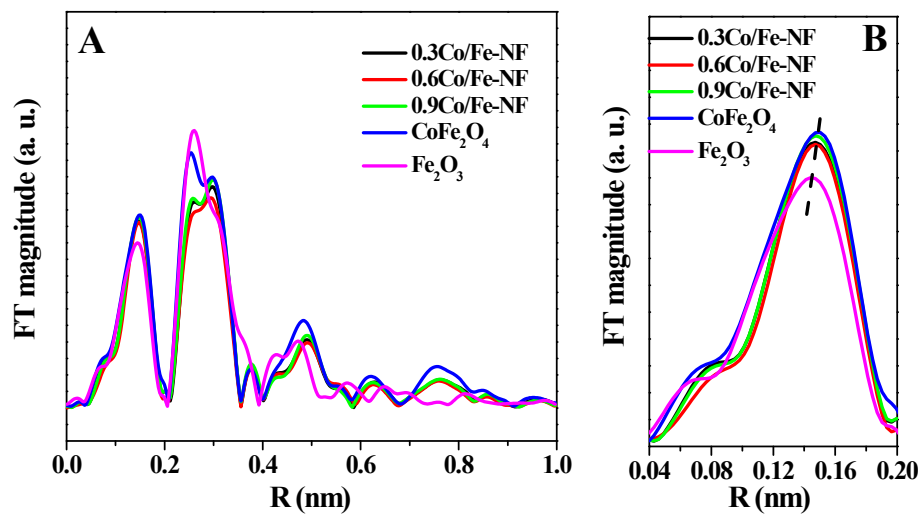
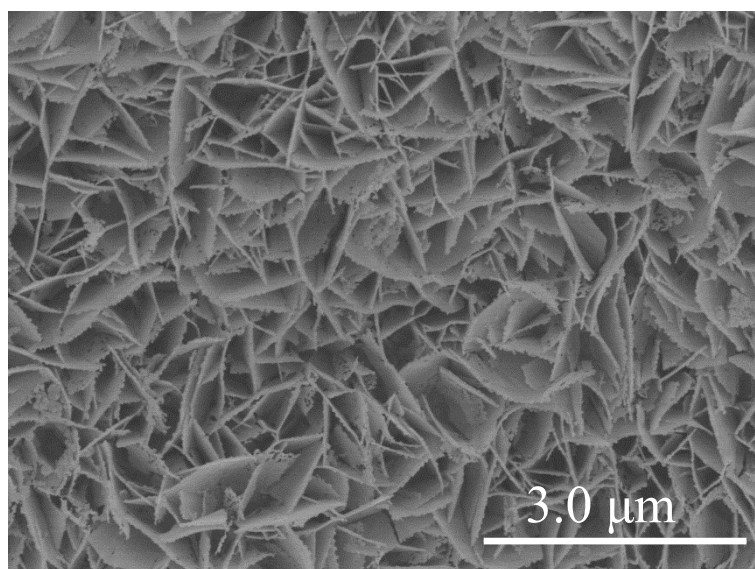


Fig. S5 (A) Radial structure functions (RSFs) of Fe K-edge of xCo/Fe-NF, Fe_2O_3 and CoFe_2O_4 derived from the extended X-ray absorption fine structure (EXAFS) spectra;

(B) the Fe-O coordination regional enlarged pattern.



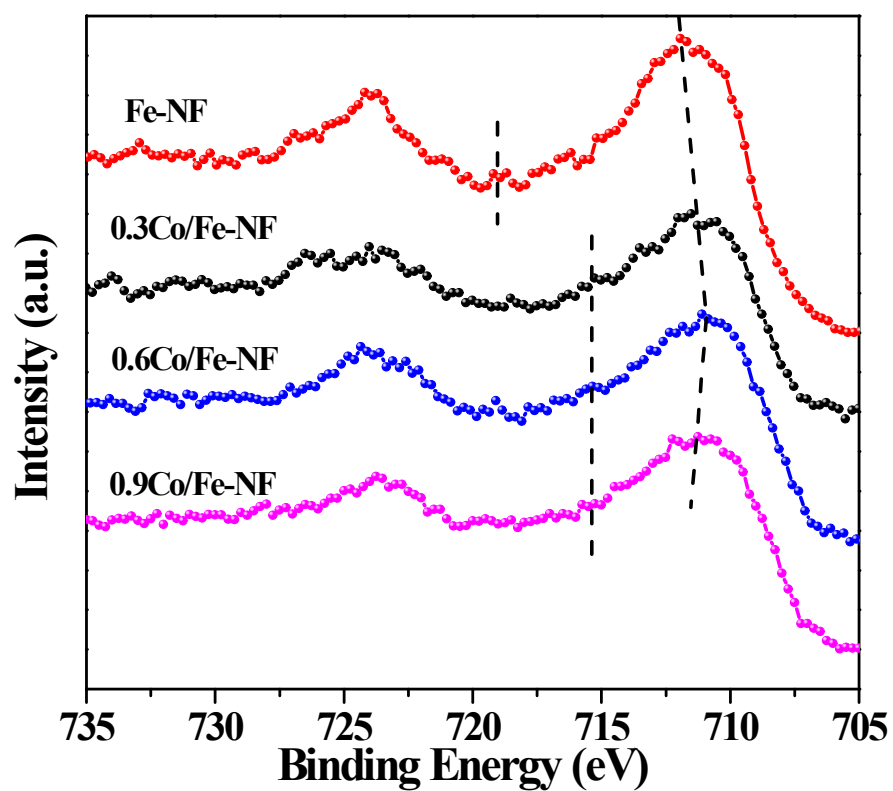


Fig. S7 The Fe 2p core level XPS of the Fe-NF and xCo/Fe-NF catalysts.