Electronic Supplementary Information (ESI)

Catalytic combustion of diesel soot over Fe and Ag-doped manganese oxides: Role of the heteroatoms in the catalytic performances

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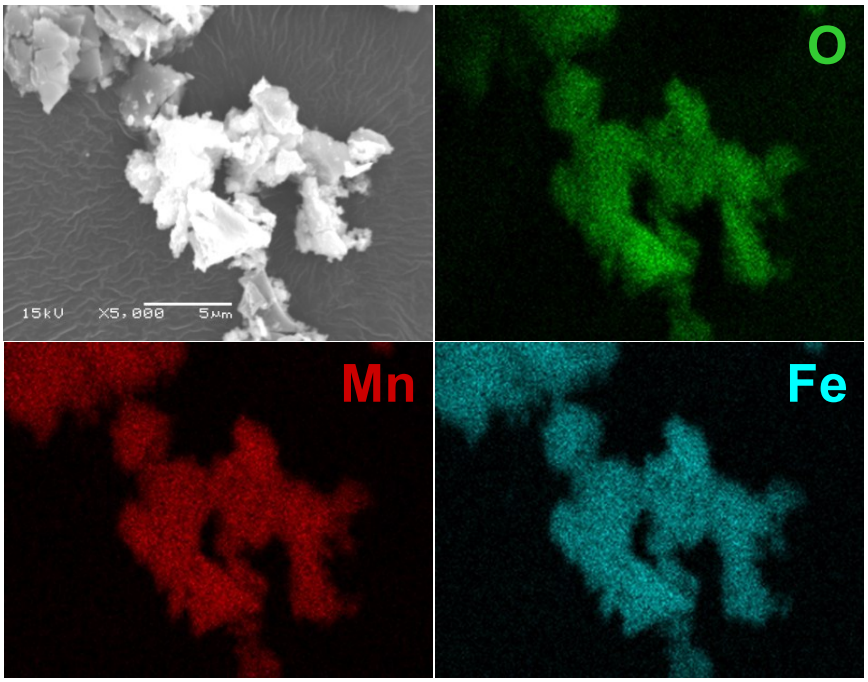

Fig. S1 (a) SEM image and the corresponding EDX mapping images for O, Mn and Fe of Fe25%-Mn_2O_3 catalyst.

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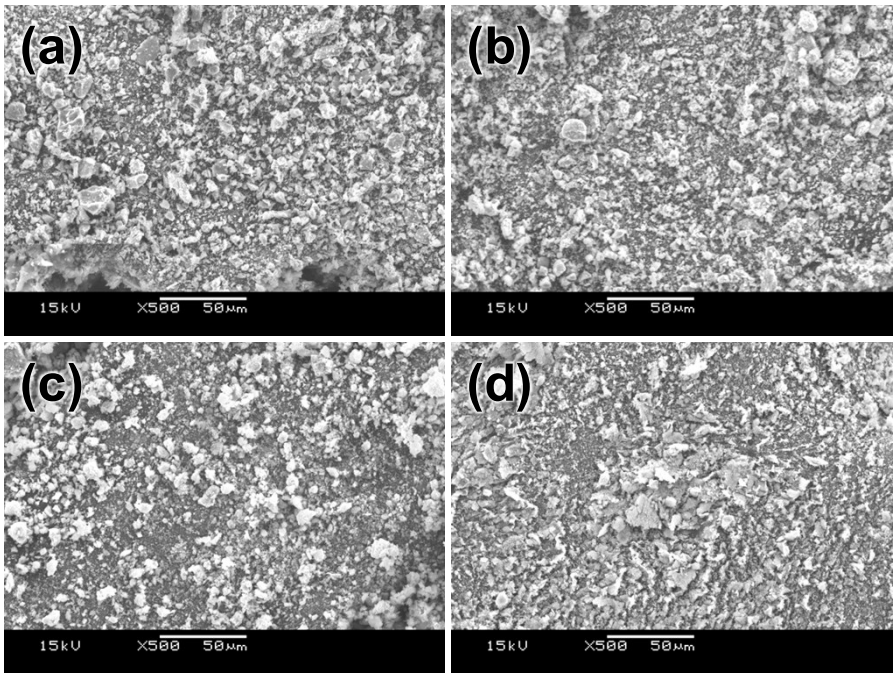

Fig. S2 SEM images of (a) pure Mn_2O_3, (b) Fe12%-Fe_2O_3, (c) Fe25%-Fe_2O_3 and (d) Fe50%-Fe_2O_3 catalysts.

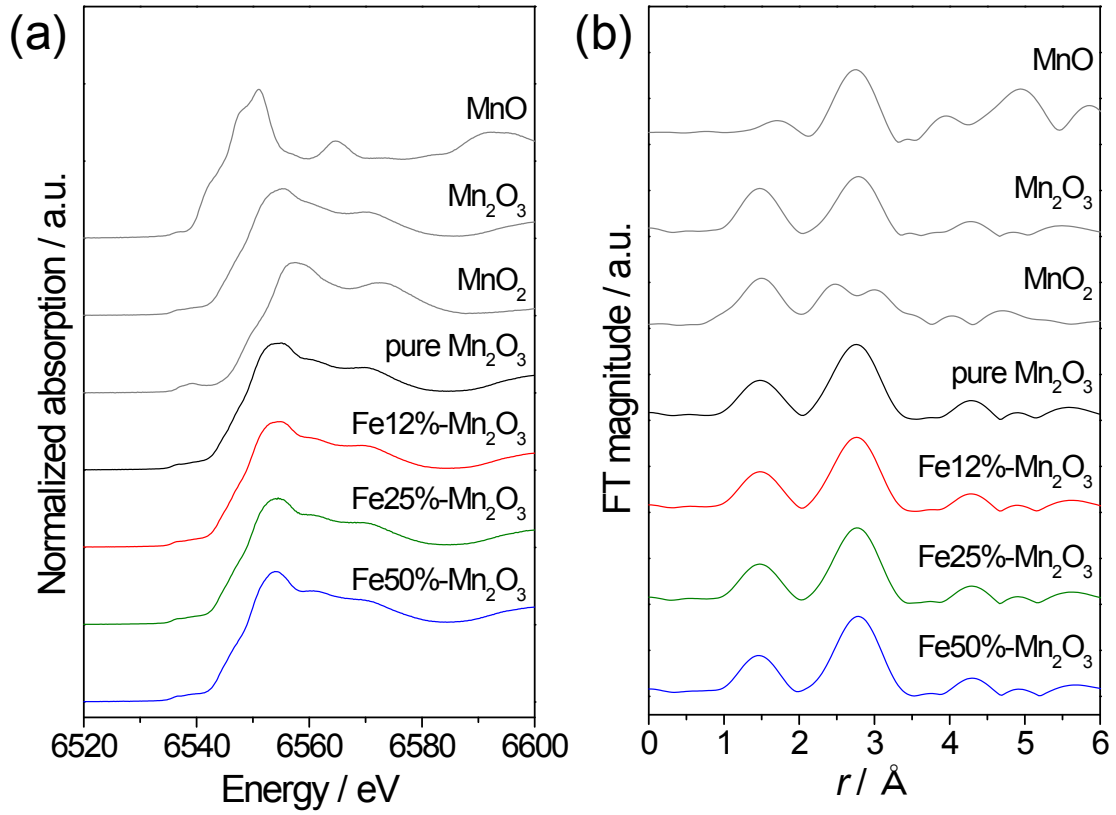

Fig. S3 (a) Mn K-edge XAFS spectra and (b) RDFs of Mn K-edge EXAFS spectra of pure Mn_2O_3, the series of Fe-doped Mn_2O_3 catalysts and several reference oxides (MnO, Mn_2O_3 and MnO_2).

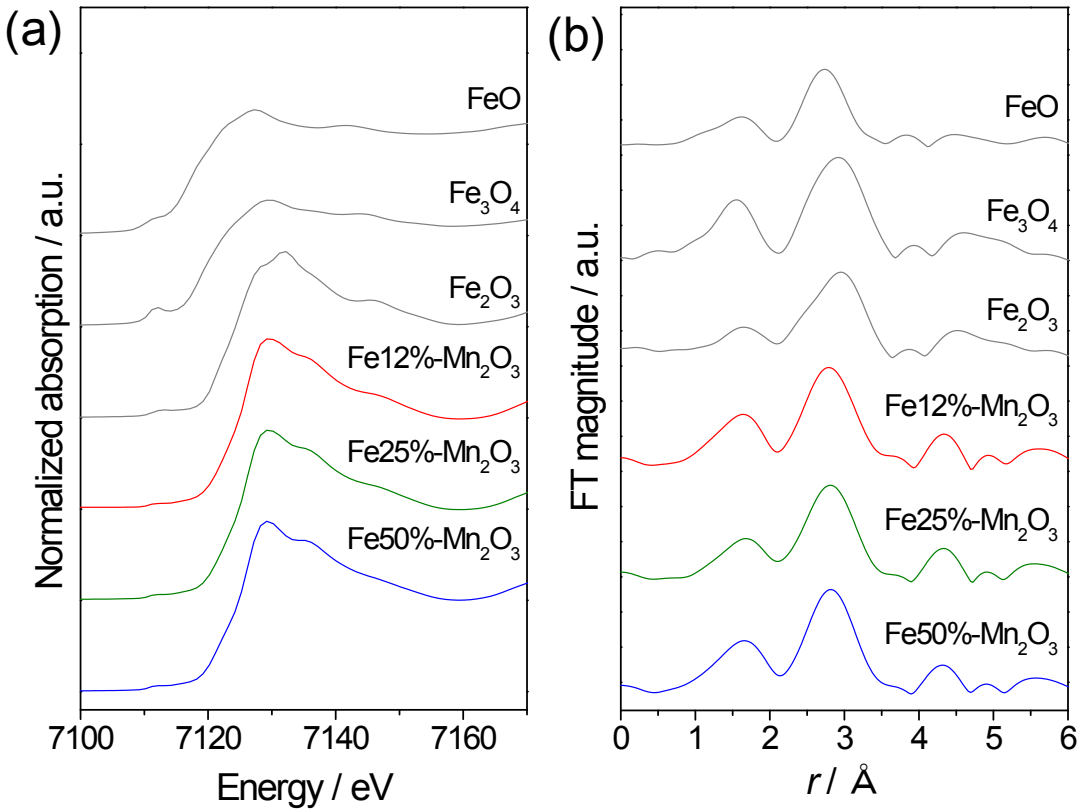

Fig. S4 (a) Fe K-edge XAFS spectra and (b) RDFs of Fe K-edge EXAFS spectra of the series of Fe-doped Mn_2O_3 catalysts and several reference oxides (FeO, Fe_3O_4 and Fe_2O_3).

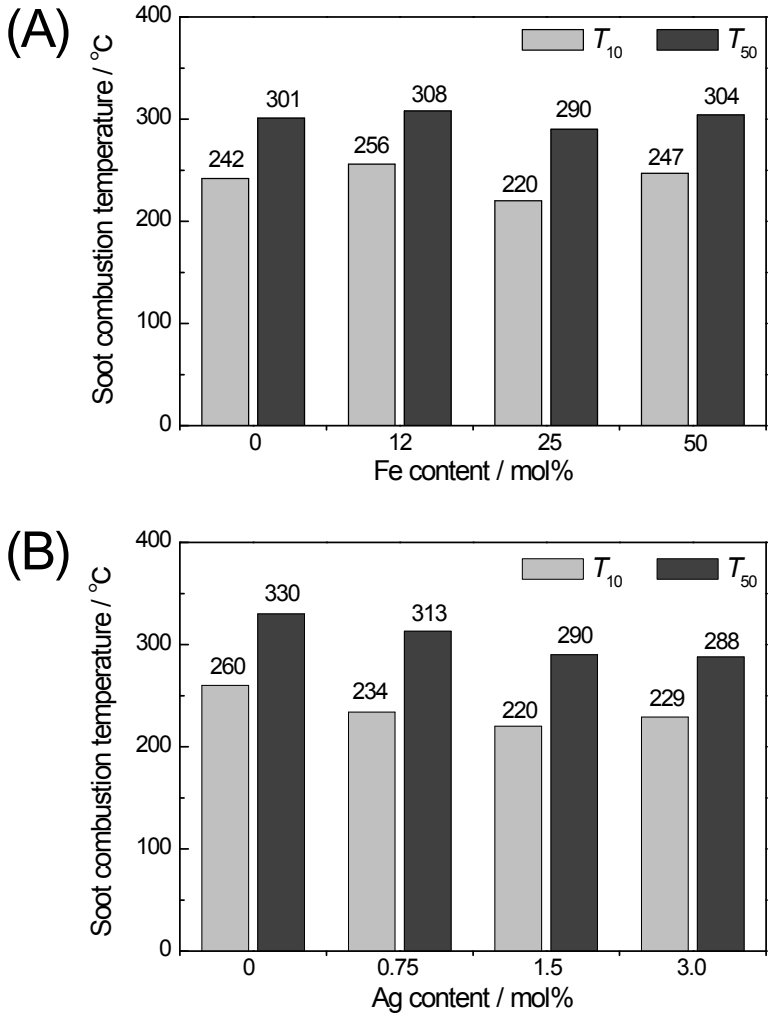

Fig. S5 Comparison of soot combustion activities of (A) Ag1.5%-doped Fe-Mn_2O_3 catalyst synthesized by varying the content of Fe (Fe = 0, 12, 25 and 50 mol%) and (B) Ag-doped Fe25%-Mn_2O_3 catalysts synthesized by varying the content of Ag (Ag = 0, 0.75, 1.5 and 3.0 mol%). The soot oxidation performance was evaluated by TG analysis in a flow of air under tight contact mode using mixtures of catalysts and model soot (Printex®V) with the weight ratio of 10:1. T_{10} and T_{50} values are defined as the temperatures at which 10 wt% and 50 wt% of soot is removed.

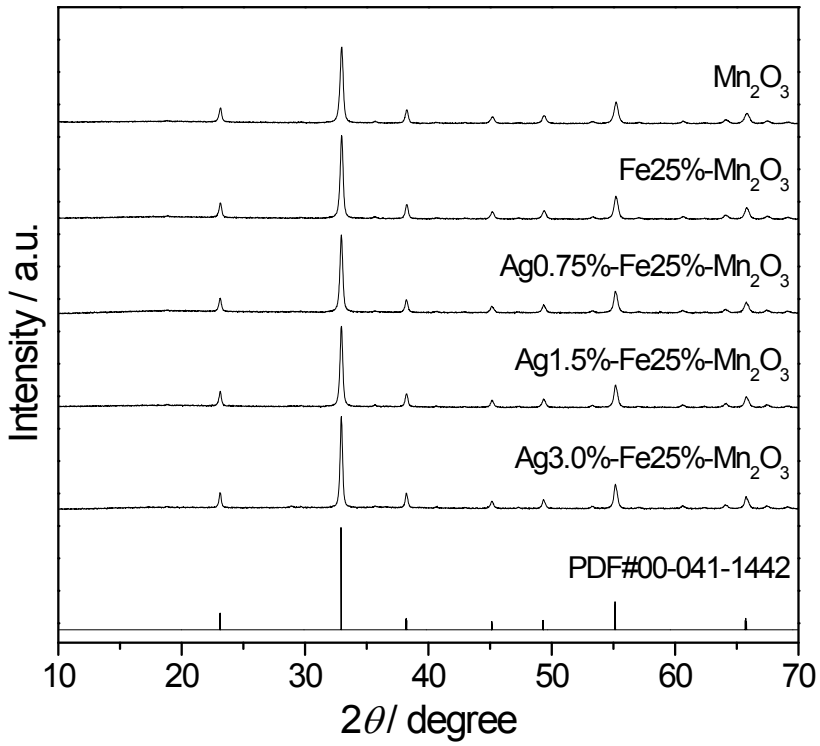

Fig. S6 XRD patterns of Ag/Fe-doped Mn_2O_3 catalysts synthesized by varying the content of Ag (Ag = 0, 0.75, 1.5 and 3.0 mol%). The line shown in the bottom represents the standard XRD pattern of α-Mn_2O_3 (PDF#00-041-1442).

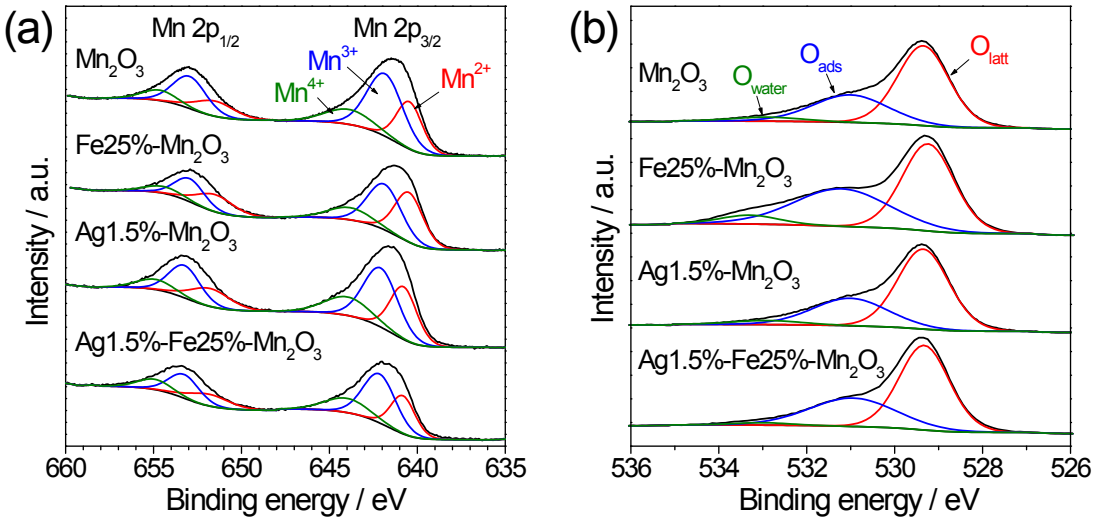

Fig. S7 (a) Mn 2p XPS spectra and (b) O 1s XPS spectra of pure Mn_2O_3, Fe25%-Mn_2O_3, Ag1.5%-Mn_2O_3 and Ag1.5%-Fe25%-Mn_2O_3 catalysts.

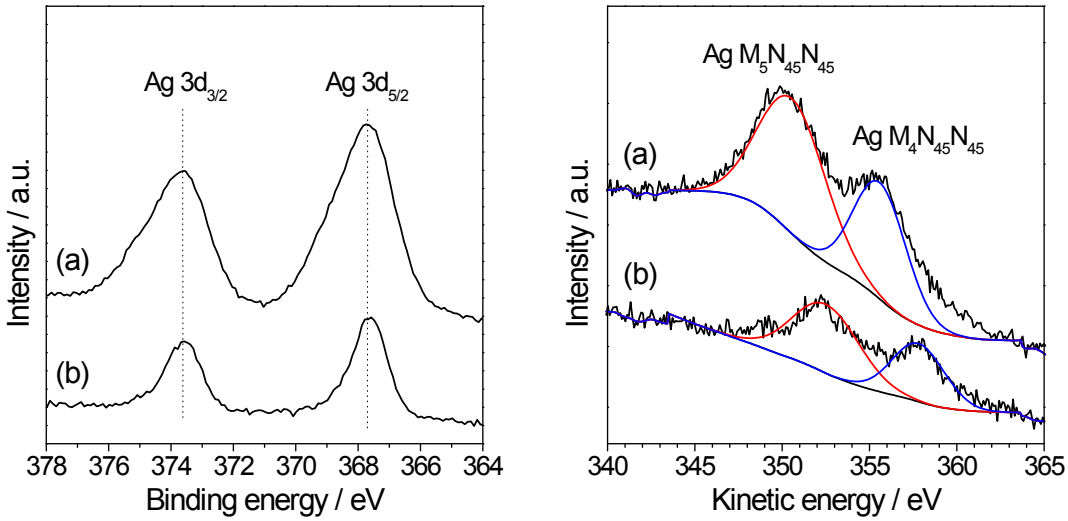

Fig. S8 (left) Ag 3d XPS spectra and (right) Ag MNN auger spectra of Ag1.5%-Fe25%-Mn_2O_3 catalyst: (a) after oxidation at 400 °C in 20% O_2/He and (b) after successive reduction at 400 °C in 20% H_2/He. The peak located at around 356 eV in the right is assignable to Ag(I) species, while that located at around 358 is associated with Ag(0) species (S. G. Aspromonte, M. D. Mizrahi, F. A. Schneeberger, J. M. R. López and A. V. Boix, *J. Phys. Chem. C*, 2013, **117**, 25433-25442).

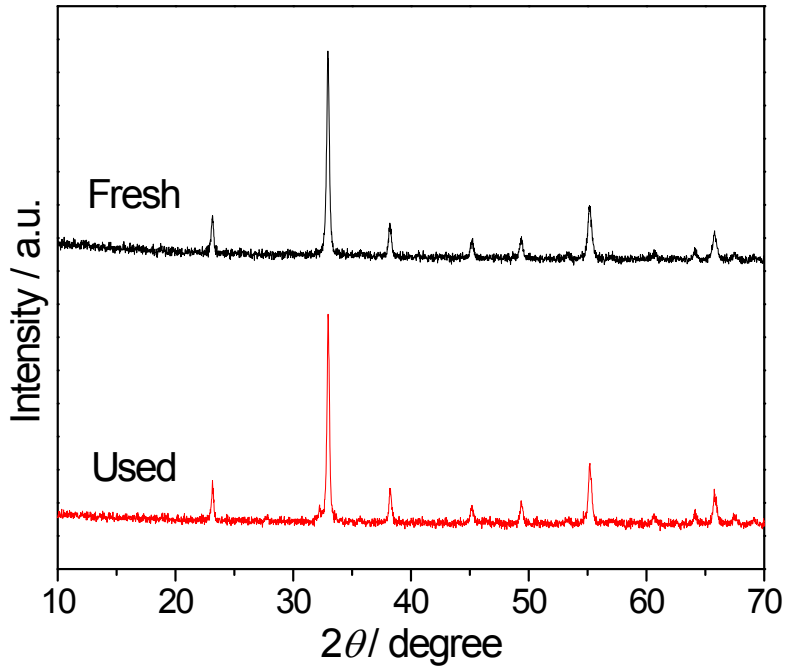

Fig. S9 XRD patterns of Ag1.5%-Fe25%-Mn_2O_3 catalyst before and after the soot oxidation reaction.