Supporting Information for:

A general corrosion route to nanostructured metal oxides

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Experimental

FeAl, TiAl, CoAl, and MnAl alloy foils with the thickness about 50 μm were made by refining high purity Fe, Ti, Co, Mn and Al (99.9 %) in an arc-furnace, respectively, followed by melt-spinning under nitrogen-protected atmosphere. The atomic content of Al in all alloy foils is 85%. NaOH were obtained from Shanghai Sinopharm Chemical Reagent Ltd. Co of China and used as received with an analytic purity. In a typical experiment, FeAl alloy foils were placed into 2 mol L^{-1} NaOH solution at 30 ^{o}C for 24h. During the dealloying process, it was found that the sample turned into black powders from the initial silver white foils. In the preparation of other metal oxides, TiAl, CoAl, and MnAl alloy foils were etched in 1 or 2 mol L^{-1} NaOH solution at room temperature for 12-48 h. The products were washed several times with ultra-pure water (18.2 MΩ) and dried at room temperature in air.

Powder X-ray diffraction data were collected on a Bruker D8 advanced X-ray diffractometer using Cu Kα radiation (λ=1.5418 Å). The measurements were done in reflection geometry at a scan rate of 0.02^{o} s^{-1}. For dealloyed CoAl and TiAl samples, XRD analysis showed they were in amorphous states. Therefore, for these two kinds of samples, the obtained precipitates were pre-annealed at 450 (for dealloyed CoAl) and 600 ^{o}C (for dealloyed TiAl) for 4-8 h under the protection of N_2, respectively, before acquiring XRD patterns (black and red lines in Figure 1a). Microstructures and composition information of samples were characterized on a JEOL JSM-6700F field emission scanning electron microscope, equipped with an Oxford INCA x-sight Energy Dispersive X-ray Spectrometer (EDS). TEM images were obtained with a JEM-2100 high-resolution transmission electron microscope (200 kV). Fe3O4 catalysts were sonicated and suspended in ethanol solution and were drop cast onto carbon-coated copper grids followed by solvent evaporation in air at room temperature. Fourier transform infrared spectroscopy (FT-IR) analysis was performed on a Perkin Elmer Spectrophotometer employing a KBr pellet method.

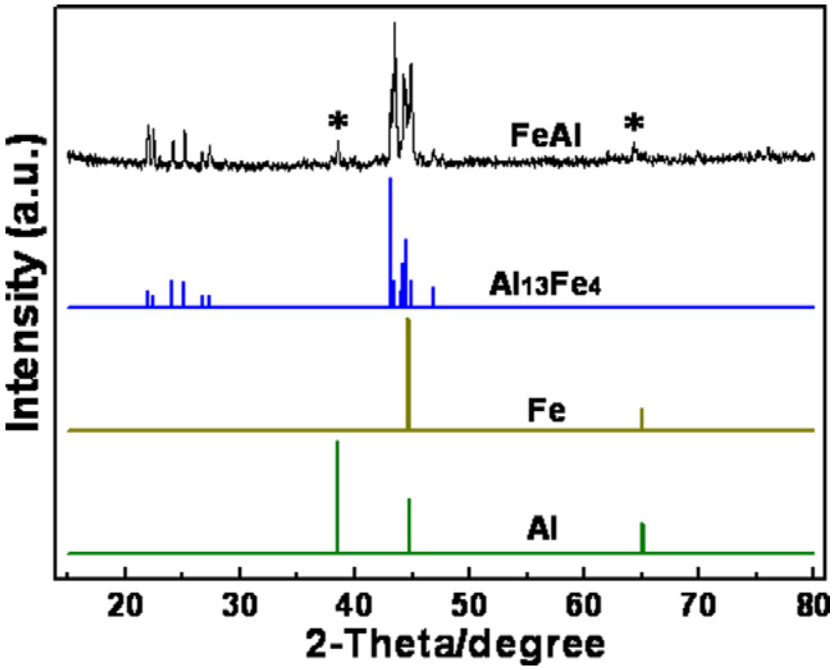
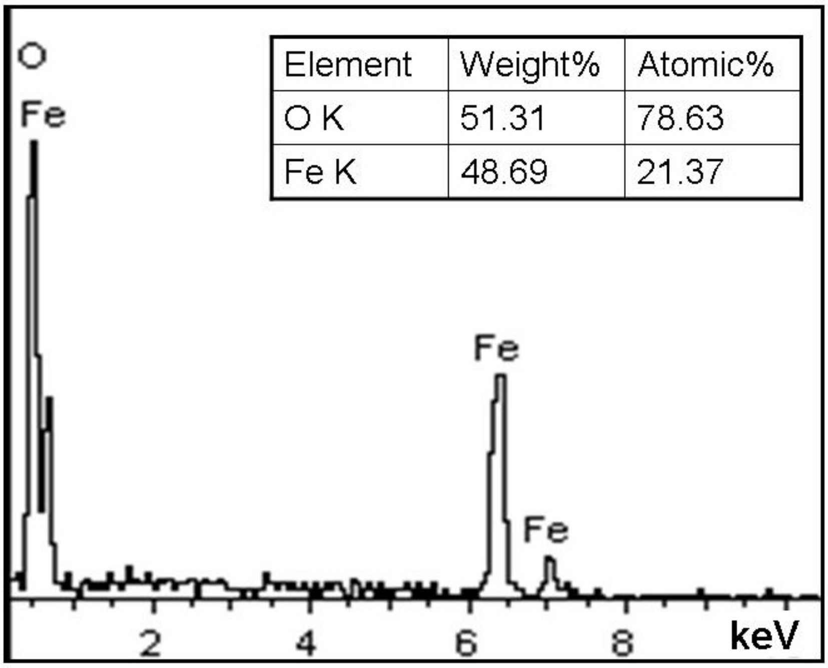


Figure S1. XRD pattern of the Fe/Al source alloy along with those for the standard $Al_{13}Fe_4$ alloy (JCPDS 50-0797), pure Fe (JCPDS 52-0513), and Al (JCPDS 65-2869).



Element	Weight%	Atomic%
O K	51.31	78.63
Fe K	48.69	21.37

Figure S2. EDS analysis for the resulted product after dealloying FeAl alloy in 5 mol L^{-1} NaOH solution for 48 h at room temperature.

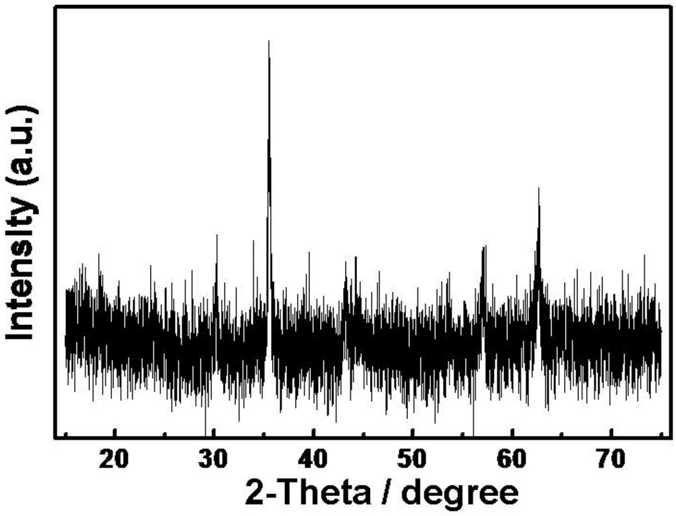


Figure S3. XRD pattern of the product upon dealloying FeAl alloy in 2 mol L^{-1} NaOH for 8 h at room temperature.

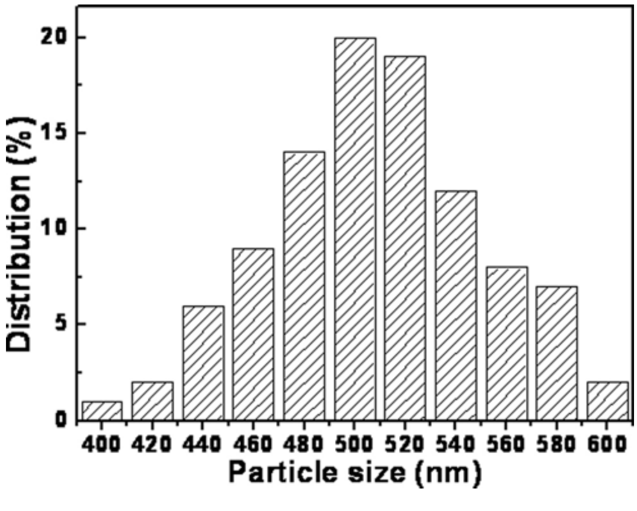


Figure S4. Histograms of the particle size distribution for Fe_3O_4 octahedra by dealloying Fe/Al alloy for 48 h in 2 M NaOH solution.

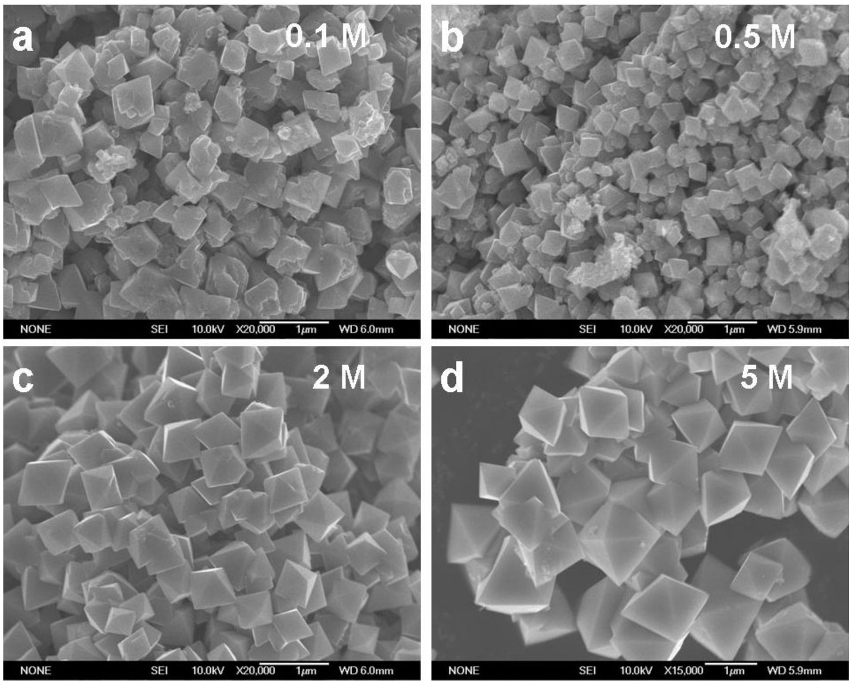


Figure S5. SEM images of the Fe_3O_4 nanostructures after dealloying for 48 h in NaOH solutions with different concentrations (shown in figures) at room temperature.

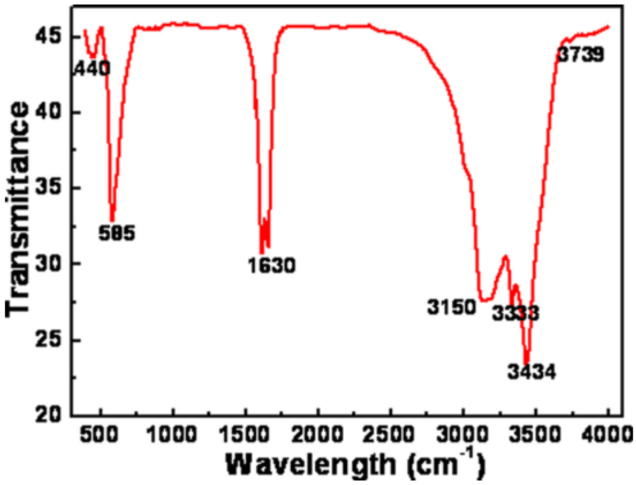


Figure S6. FTIR spectrum of Fe_3O_4 octahedra.

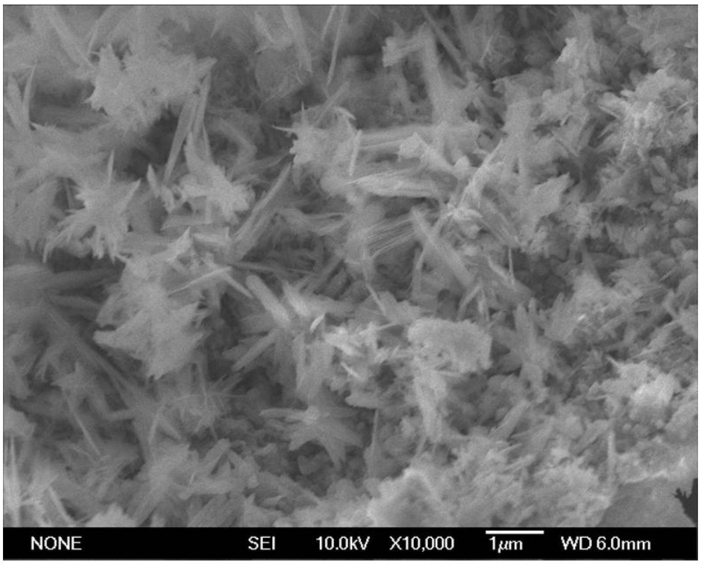


Figure S7. SEM image of the resulted Fe_3O_4 sample after dealloying in 0.05 mol L^{-1} NaOH solution at room temperature for 24 h.

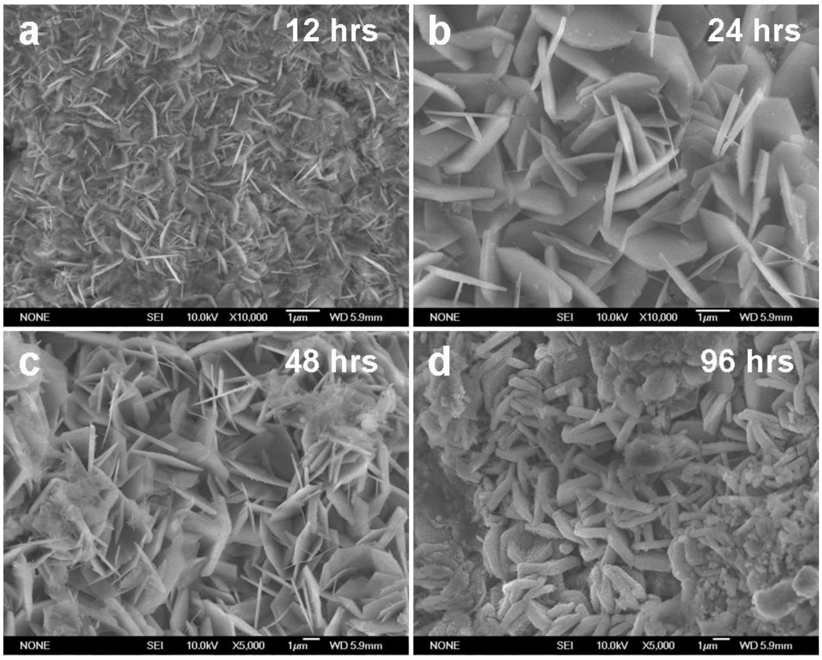


Figure S8. SEM images of the resulted Co_3O_4 nanostructures after dealloying for 12, 24, 48, and 96 h in 2 mol L^{-1} NaOH solution at room temperature, respectively.

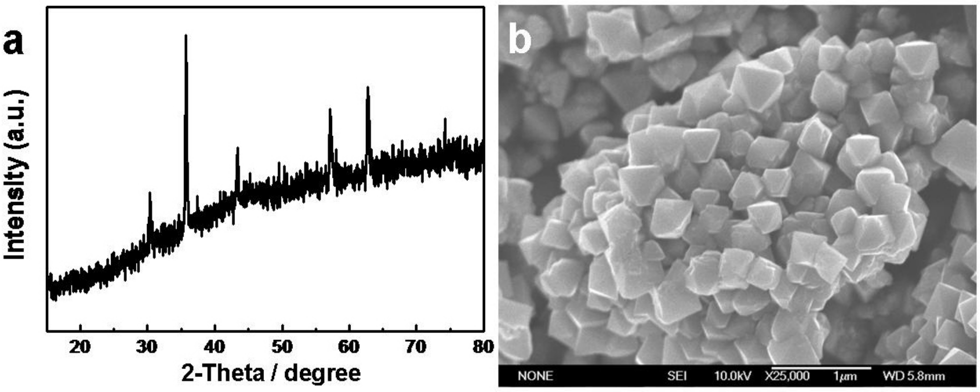


Figure S9. (a) XRD pattern and (b) SEM image of the sample after dealloying under the protection of N_2 for 24 h in 2 mol L^{-1} NaOH solution at room temperature.

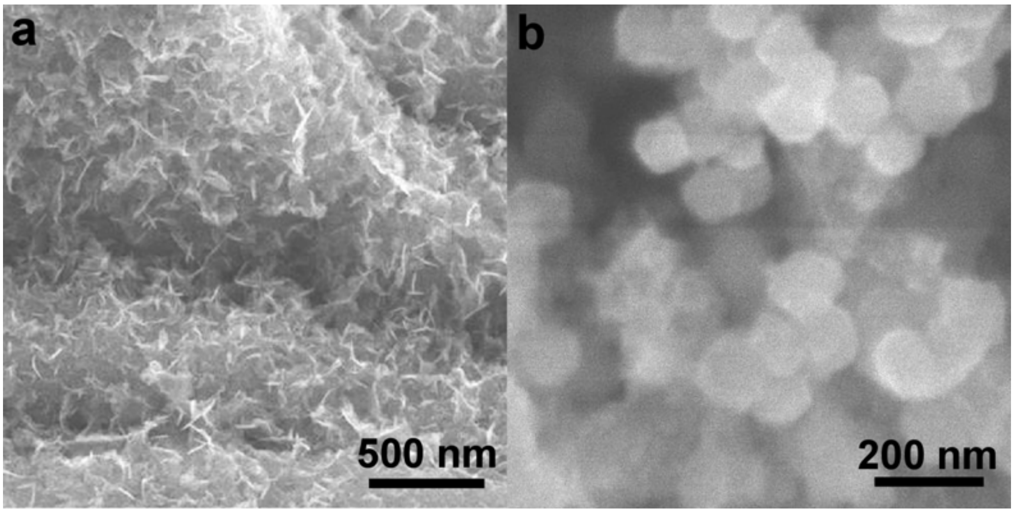


Figure S10. (a) SEM image of the sample after dealloying FeAl alloy in 0.2 mol L^{-1} NaOH solution in the presence of potassium citrate for 24 h at room temperature; (b) SEM image of the sample after dealloying FeAl alloy in 50 mmol L^{-1} HCl solution for 10 h at room temperature.

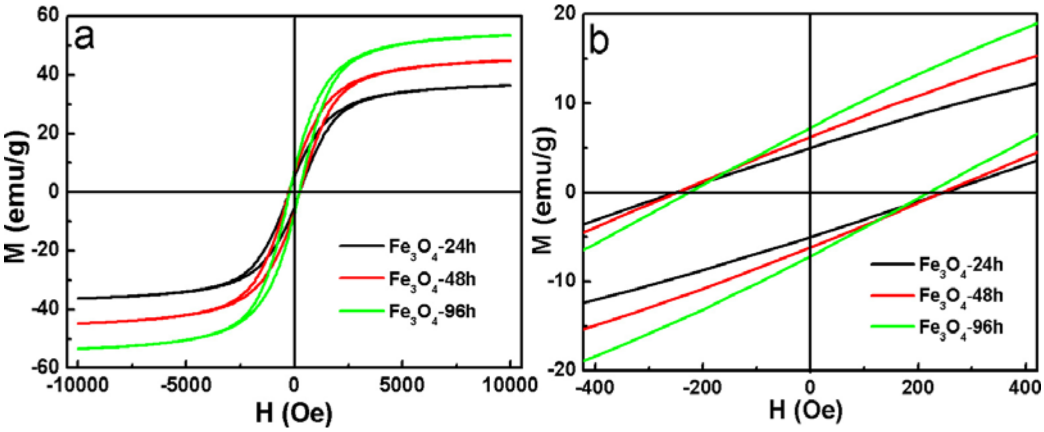


Figure S11. Room temperature magnetization curves (a) and part enlarged curves (b) recorded on as-prepared Fe_3O_4 octahedra after dealloying in 2 mol L^{-1} NaOH solution at room temperature for 24, 48, 96 h, respectively.