

Supporting Information for

Wall-Number Selective Growth of Vertically Aligned Carbon Nanotubes from FePt Catalyst: A Comparative Study with Fe Catalyst

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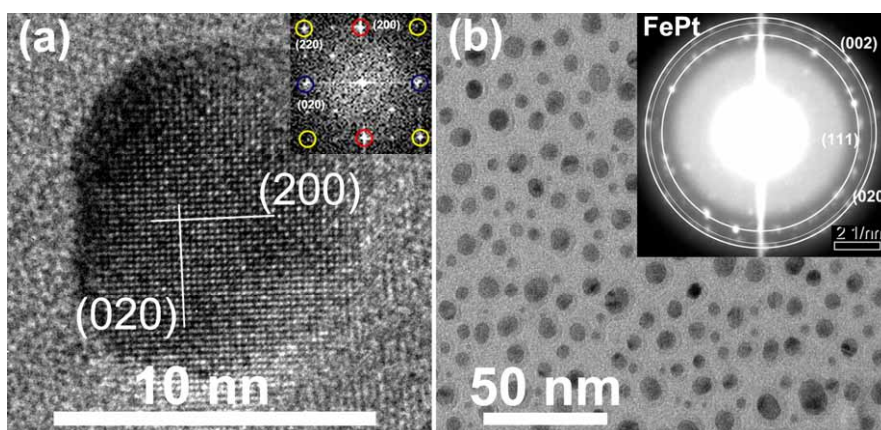


Fig. S1 (a) Typical high resolution TEM image of a FePt NP; (b) Low magnification TEM image of the FePt NPs. Inset shows a selected area electron diffraction pattern of the FePt NPs.

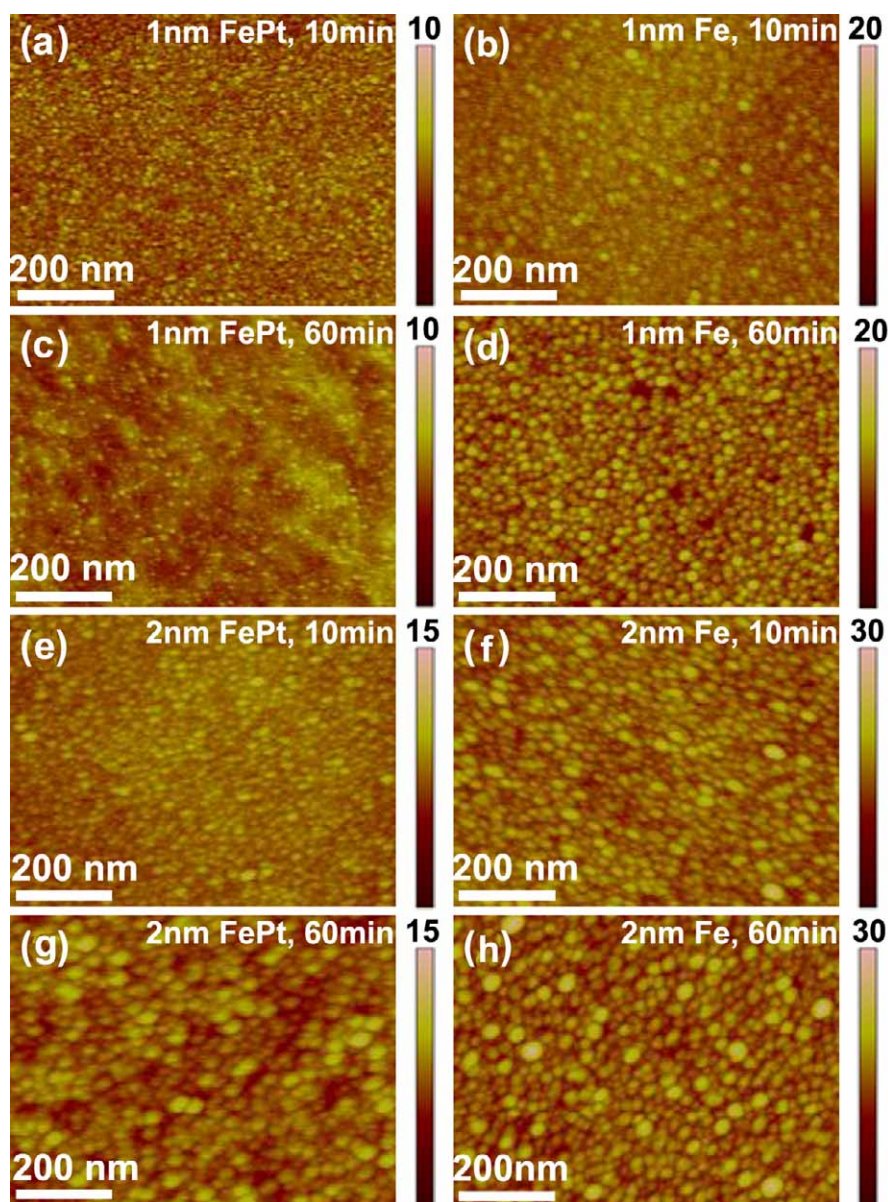


Fig. S2 AFM images showing the thermal aggregation behavior of FePt and Fe films at 775 °C under Ar/H₂ atmosphere. (a) 1 nm FePt, 10 min annealing; (b) 1 nm Fe, 10 min annealing; (c) 1 nm FePt, 60 min annealing; (d) 1 nm Fe, 60 min annealing; (e) 2 nm FePt, 10 min annealing; (f) 2 nm Fe, 10 min annealing; (g) 2 nm FePt, 60 min annealing; (h) 2 nm Fe, 60 min annealing.

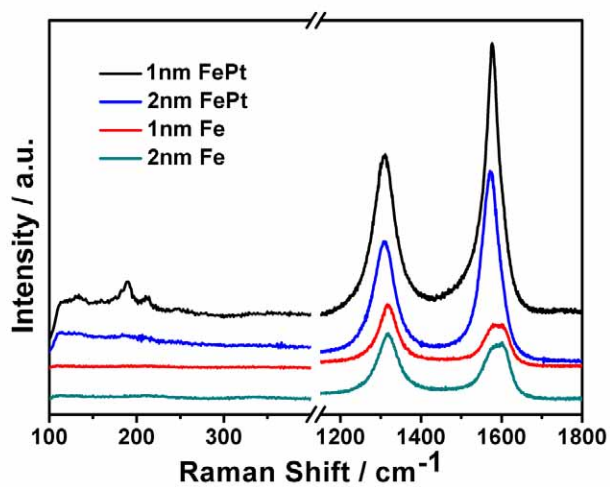


Fig. S3 Laser Raman spectra of the VA-CNTs grown from the FePt and Fe catalyst (as shown in Figure 3) using an excitation wavelength of 632.8 nm.

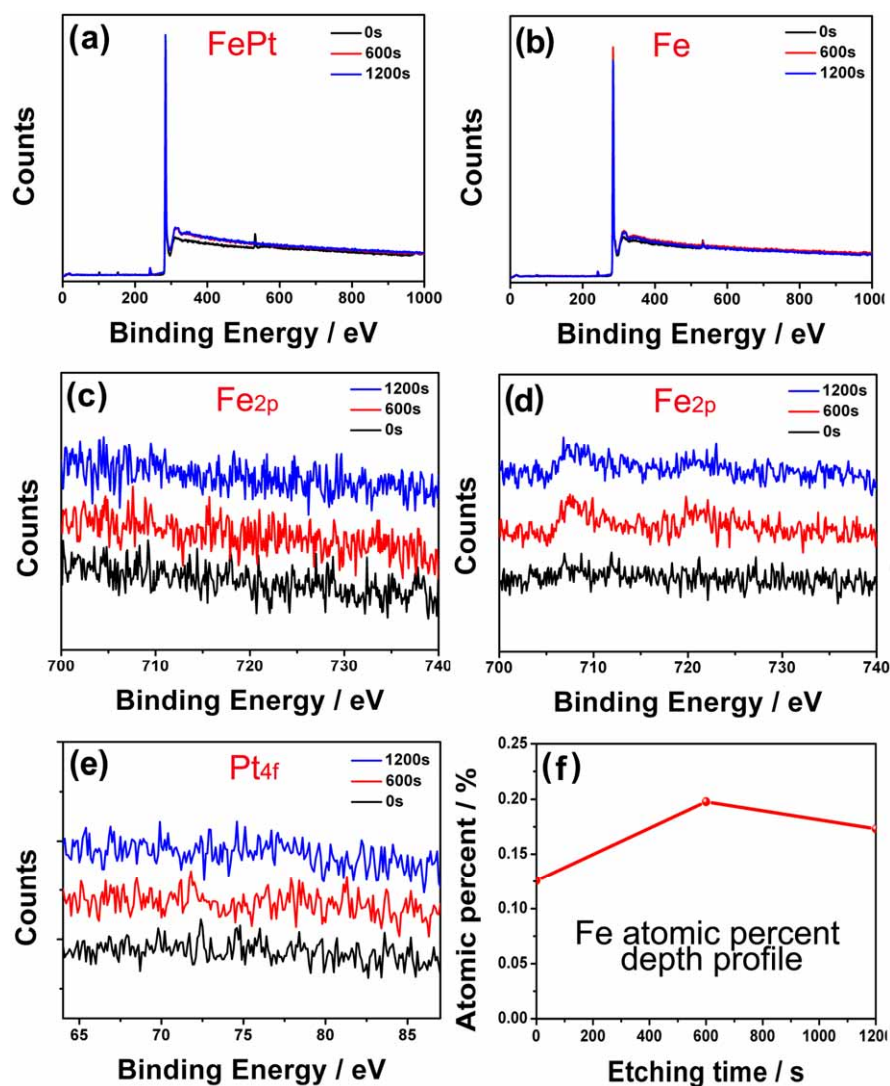


Fig. S4 Survey XPS spectra of the VA-CNTs grown from (a) 2 nm-thick FePt catalyst film; (b) 2 nm-thick Fe catalyst film. High resolution Fe_{2p} and Pt_{4f} spectra for the VA-CNTs grown from (c, e) the 2 nm-thick FePt catalyst film and (d) the 2 nm-thick Fe catalyst film. (f) Atomic percent depth profile of Fe residue in the VA-CNTs grown from the 2 nm-thick Fe catalyst film. No Fe and Pt residues can be detected in the VA-CNTs grown from the 2 nm-thick FePt catalyst film.

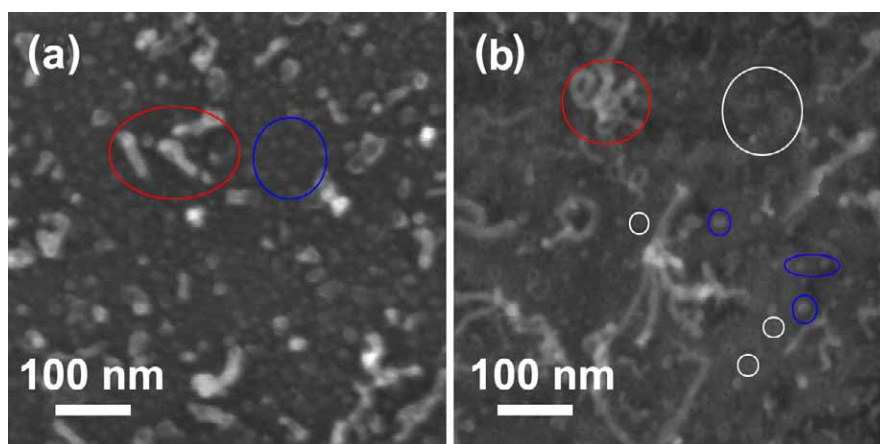


Fig. S5 SEM images of the substrate surface after the grown VA-CNTs were removed. (a) Substrate with the 2 nm FePt as catalyst; (b) Substrate with the 2 nm Fe as catalyst. Red circles labeled in the images show the residual broken CNTs; in blue circles are the anchored catalyst NPs; the white circles show holes left by pulling off the catalyst NPs.

Table S1. The size distribution, mean size and area density of the FePt and Fe catalyst NPs

	Catalyst film thickness	NP Size distribution	NP Mean size	NP area density
FePt	1 nm	1-5 nm	2.7 nm	$\sim 2.1 \times 10^{12} \text{ cm}^{-2}$
Fe	1 nm	6-20 nm for Fe-FeO _x NPs 5-17 nm for Fe NP	13.6 nm for Fe-FeO _x NPs 11.4 nm for Fe NP	$\sim 1.0 \times 10^{11} \text{ cm}^{-2}$
FePt	2 nm	1-13 nm	8.1 nm	$\sim 3.0 \times 10^{11} \text{ cm}^{-2}$
Fe	2 nm	13-29 nm for Fe-FeO _x NPs 11-25 nm for Fe NP	20.8 nm for Fe-FeO _x NPs 17.4 nm for Fe NP	$\sim 5.8 \times 10^{10} \text{ cm}^{-2}$