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## Supplementary

# Effects of interfacial transition layers on the electrical properties of individual $Fe_{30}Co_{61}Cu_9$/Cu multilayered nanowires

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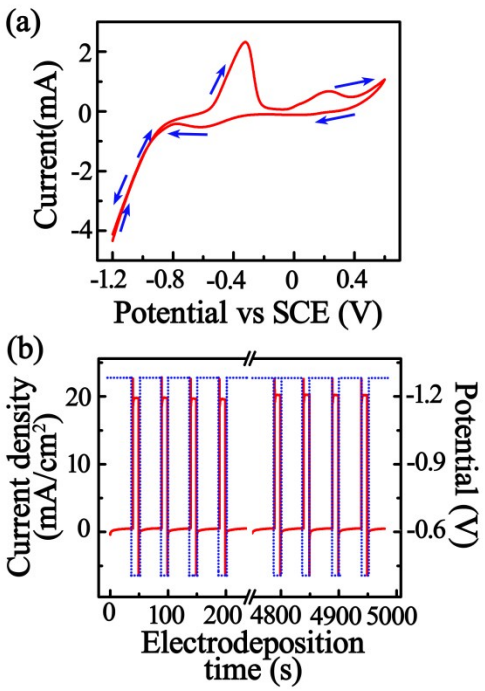


**Fig. S1** (a) Cyclic voltammetry recorded from a FeCo–Cu electrolytic solution used for the electrodeposition of multilayered$Fe_{30}Co_{61}Cu_9$/Cu nanowires at a scanning rate of10 mV/s. (b) Typical time-dependence curves of the applied deposition potential versus SCE (blue curve) and the observed current density (red curve) during the growth of $Fe_{30}Co_{61}Cu_9$/Cu MNWs.

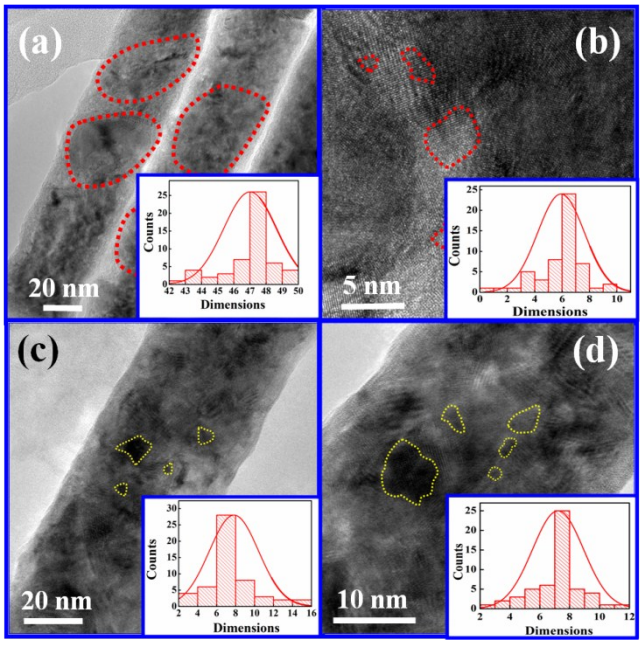


**Fig. S2** HR-TEM images of grains inside a: (a) single-phase Cu nanowire; (b) Cu layer in a $Fe_{30}Co_{61}Cu_9$/Cu MNW; (c) single-phase $Fe_{30}Co_{61}Cu_9$ nanowire; and (d) $Fe_{30}Co_{61}Cu_9$ layer in a $Fe_{30}Co_{61}Cu_9$/Cu nanowire. Insets present the corresponding statistical grain size chart.

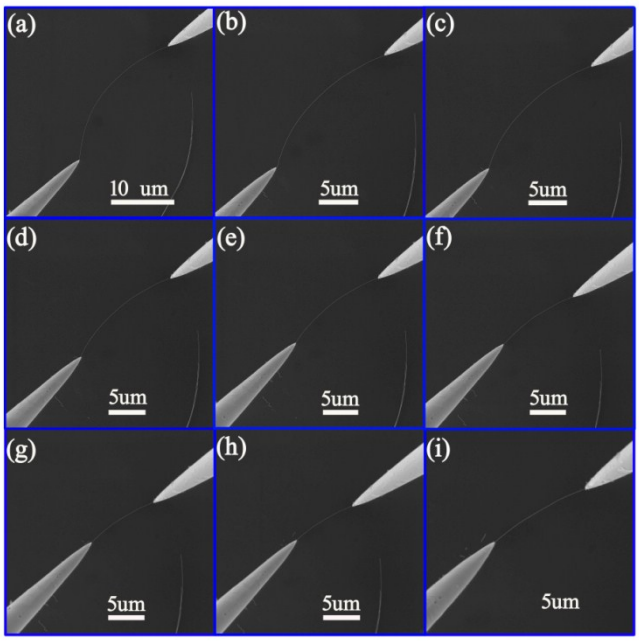


**Fig. S3** SEM images ofpositions used to measure the resistance of single $Fe_{30}Co_{61}Cu_9$/Cu MNWs; results were used to determine the $R_T$-$L$ curve in Fig. 5 (a).

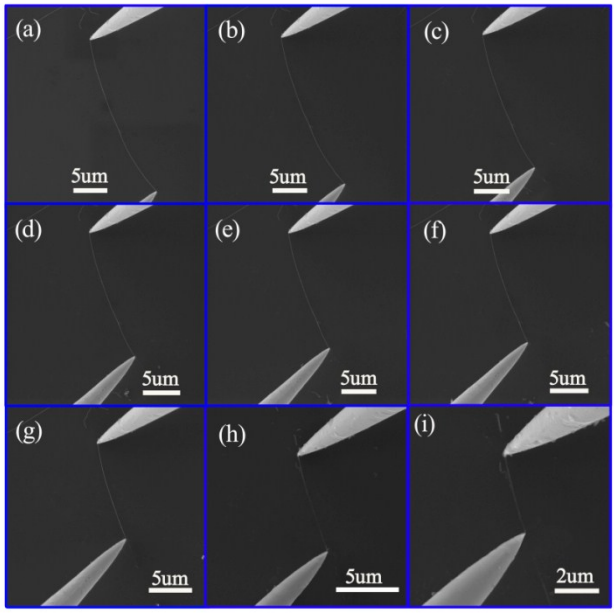


**Fig. S4** SEM images ofpositions used to measure single-phase Cu nanowires, which were used to determine the $R_c$-$L$ curve in Fig. 5b.

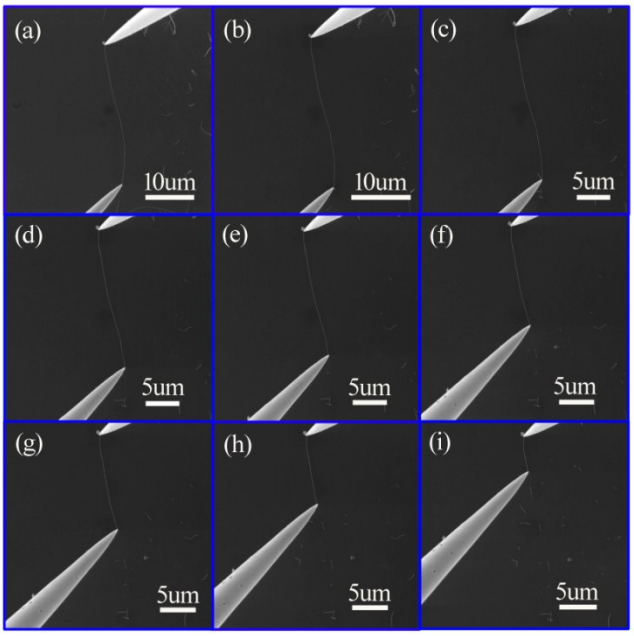


**Fig. S5** SEM images ofthe positions used to measure single $Fe_{31}Co_{60}Cu_9$ nanowires, which wereused to determine the $R_T$-$L$ curve in Fig. 5f.