Supporting information for

Wrinkles-Stabilized Metal-Graphene Hybrid Fibers with Zero Temperature Coefficient of Resistance

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Figure S1. The picture and SEM image of graphene film.

Figure S2. The pictures of copper-coated graphene film before and after rinsing in water.

Figure S3. Raman spectrum of GF.

Figure S4. Schematic of copper electroplating technology.

Figure S5. SEM images of a twisting graphene film.

Figure S6. SEM images of graphene fiber coated by Co and Mg.

Figure S7. The measured resistance and TCR vs. temperature plots of GF, pure Au, and pure Cu.

Figure S8. The optical images of GF coated with different thickness of Au and Cu.

Figure S9. The TCR vs. temperature plots of GF coated with different thickness of Cu, Au, Co and Ni.

Table S1. Physical properties of GFs coated with 5 μm-metals.

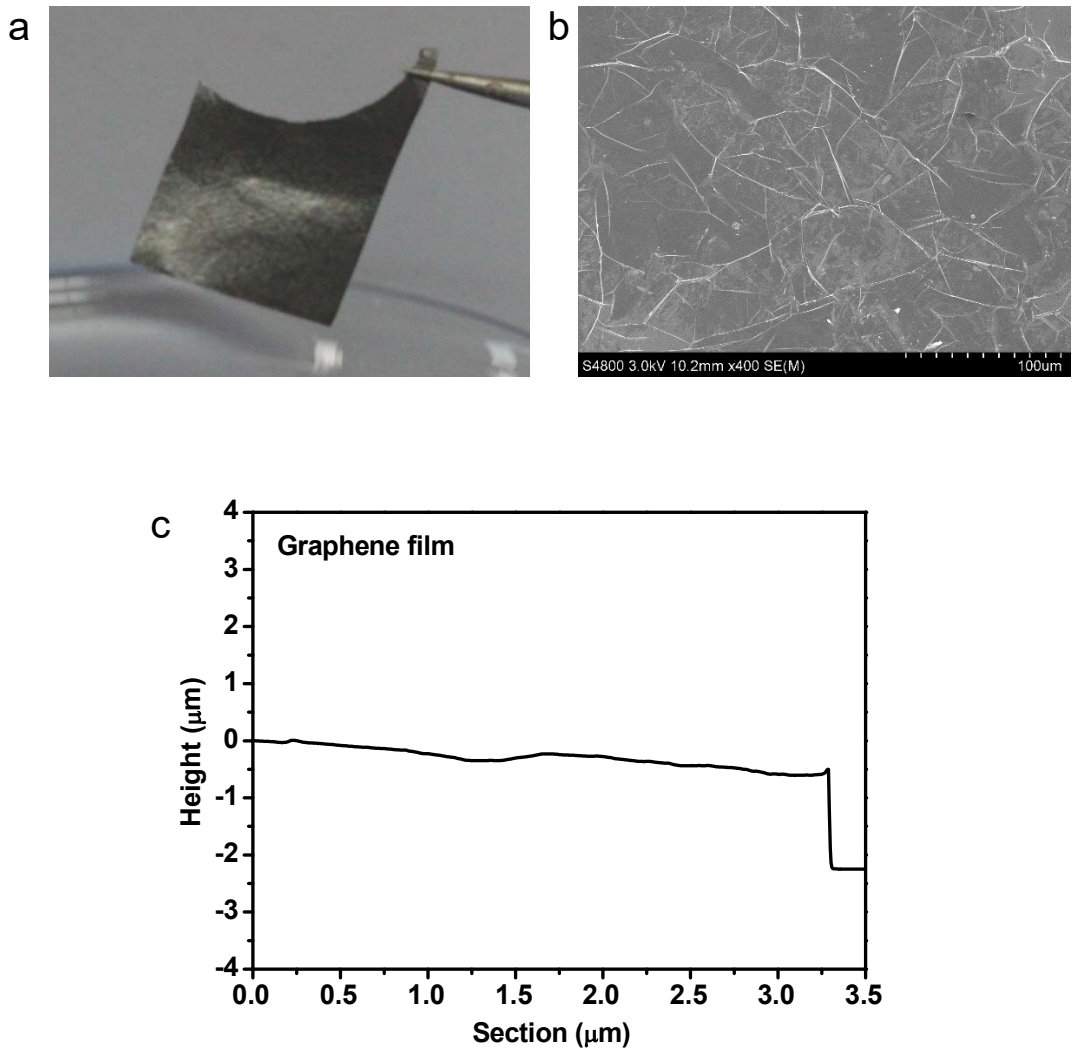

Figure S1. The picture (a) and SEM image (b) of graphene film before undergoing electroplating, showing the smooth surface of graphene films. (c) The typical surface topography of graphene film measured by profilometer, figuring out the highly smooth feature of graphene film. Some trace lines in figure b were formed by the mismatched stacking of graphene sheets.

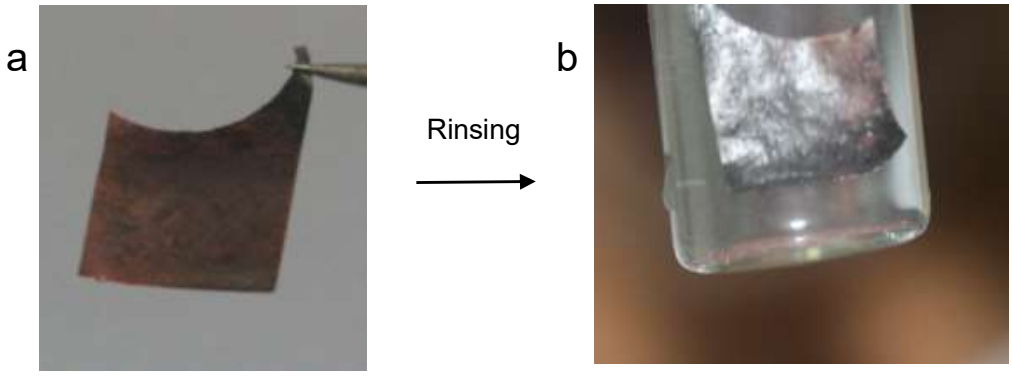

Figure S2. The pictures of copper-coated graphene film before (a) and after (b) rinsing in water.

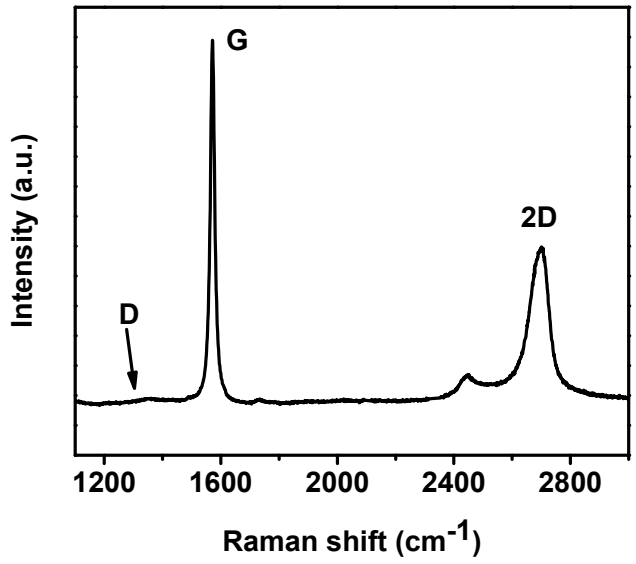

Figure S3. Raman spectrum of graphene sheet after high temperature treatment.

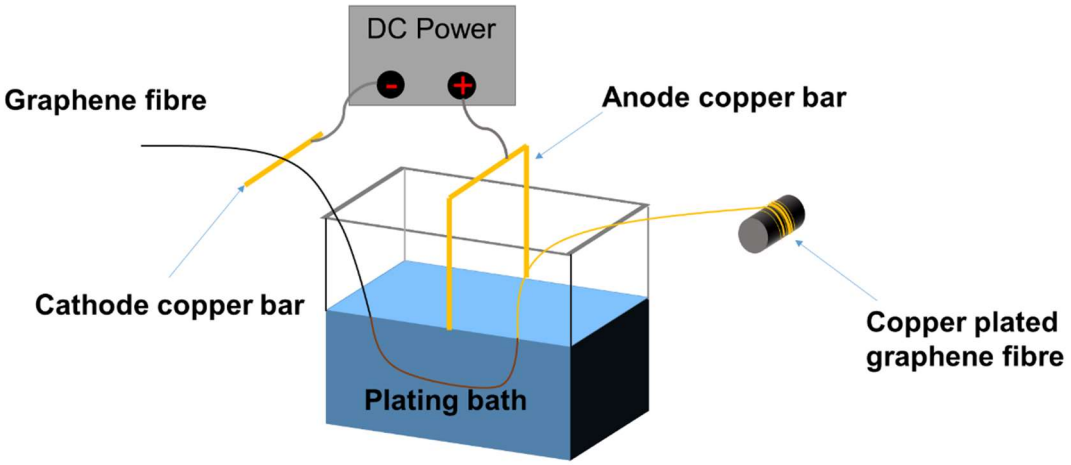

Figure S4. Schematic of copper electroplating technology. Graphene fibers contact with cathode copper bar, which is connecting with the cathode of a DC power. And an arched copper bar is used as anode. Graphene fiber moves slowly through the plating bath, and the plated fiber is collected on a winder.

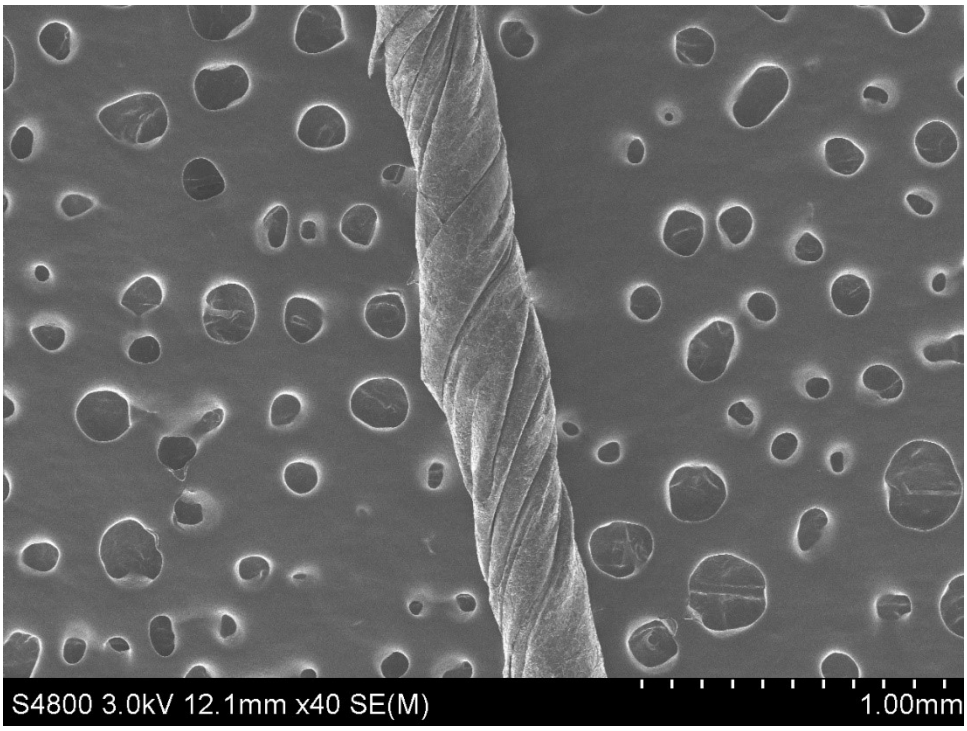

Figure S5. SEM images of a twisting graphene film with uniform grooves.

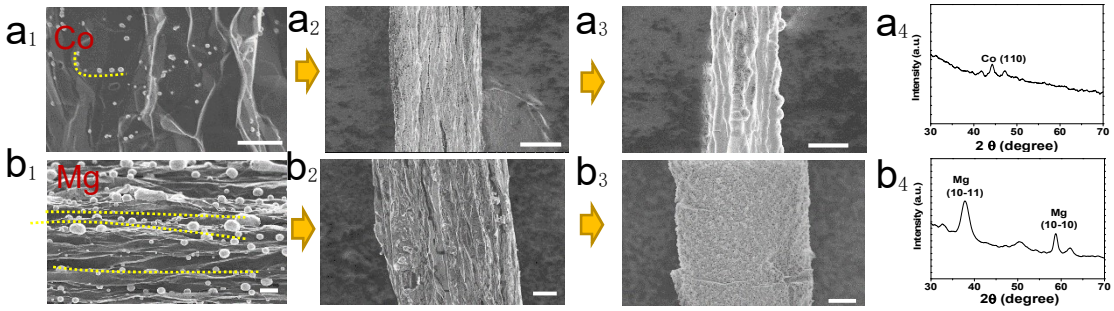

Figure S6. SEM images of graphene fiber coated by Co ($a_{1\text{-}3}$), Mg ($b_{1\text{-}3}$), showing the growing process of metal layer. The dotted lines and circles mark that the distribution of metal grains along wrinkles. And the corresponding XRD spectra for the fibers completely coated by metal $(a\text{-}b)_4$. Scale bars: (a_1, b_1) 2 μm; (b_2) 10 μm; ($a_{2\text{-}3}$, b_3) 50 μm.

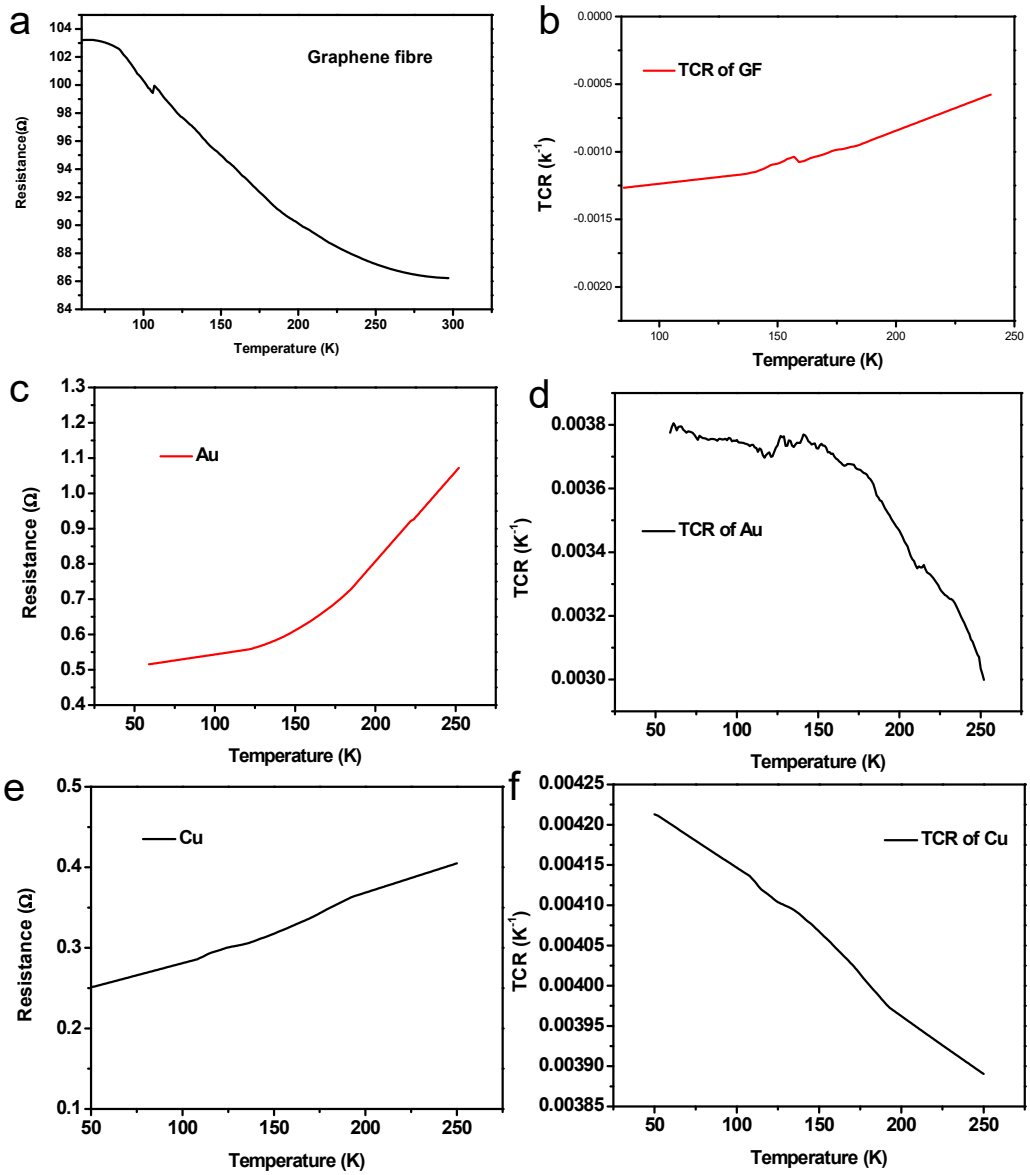

Figure S7. The measured resistance vs. temperature plots of GF (a), pure Au (c), pure Cu (e), and the corresponding TCR vs. temperature curves of GF(b), pure Au (d), pure Cu (f), respectively.

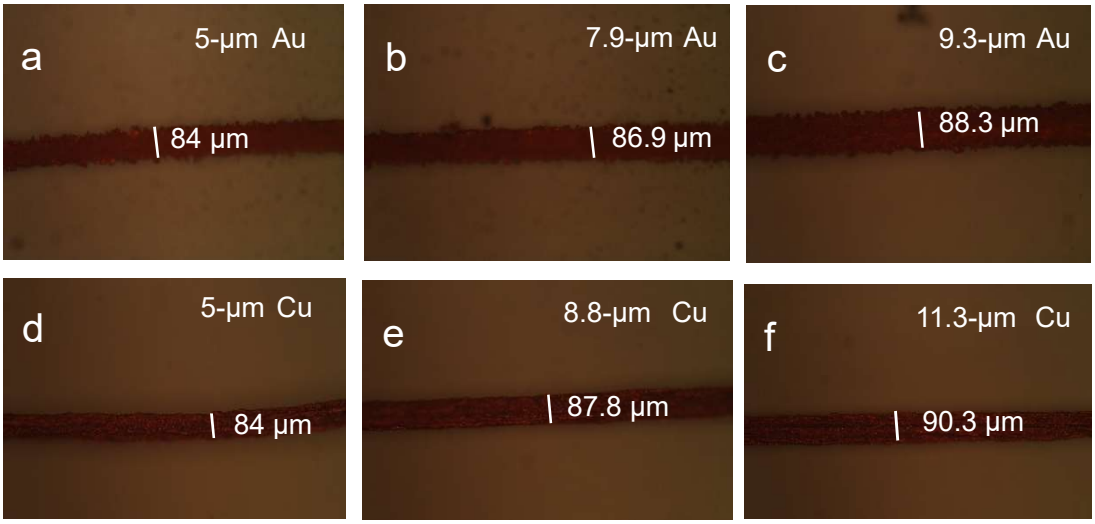

Figure S8. The optical images of GF coated with different thickness of Au and Cu.

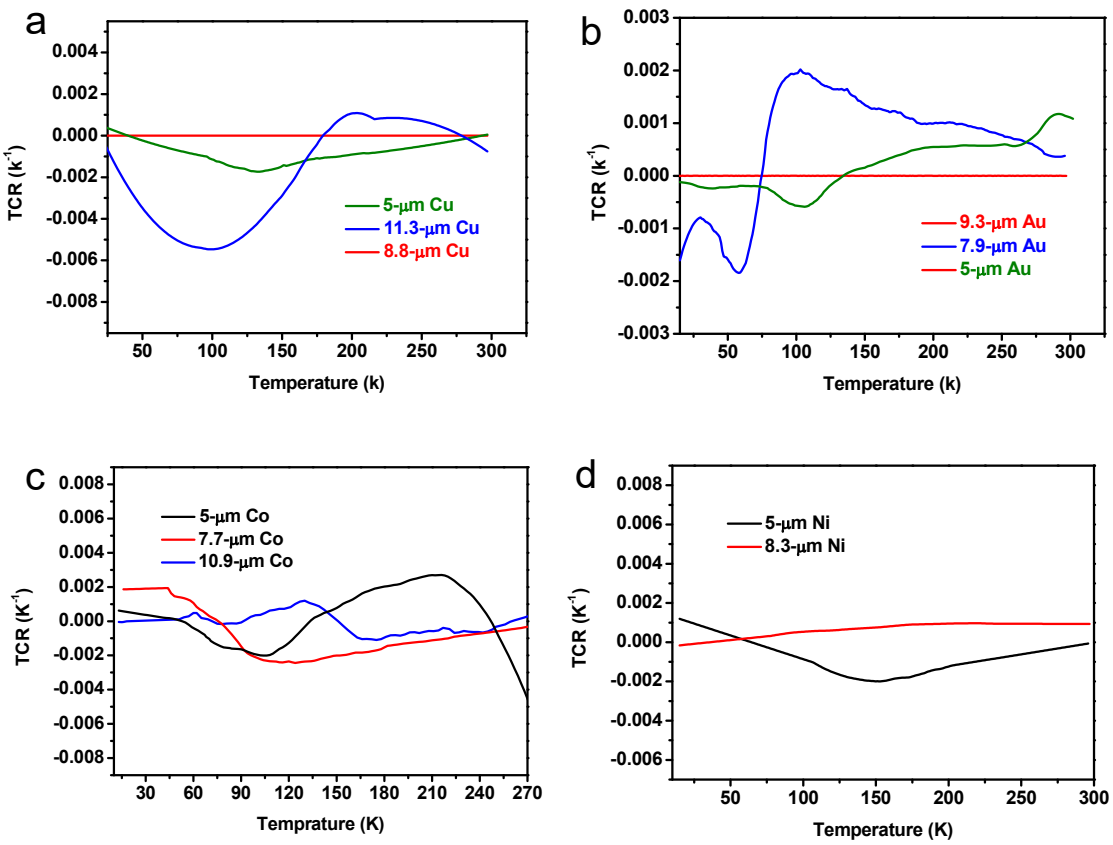

Figure S9. The TCR vs. temperature plots of GF coated with different thickness of Cu (a), Au (b), Co (c) and Ni (d).

Table S1. Physical properties of GFs coated with 5 µm-metals					
	Conductivity ($S\ m^{-1}$)	Volume Density ($g\ cm^{-3}$)	Specific Conductivity ($S\ m^2\ Kg^{-1}$)	Density of Metal Layer ($g\ cm^{-3}$)	Density of Bulky Metal ($g\ cm^{-3}$)
Ag-plated	2.2×10^7	2.91	7.6×10^3	9.1	10.5
Cu-plated	1.3×10^7	2.69	4.8×10^3	8.2	8.96
Au-plated	1.1×10^7	4.55	2.4×10^3	16.9	18.88
Co-plated	6.3×10^6	2.75	2.3×10^3	8.2	8.9
Mg-plated	8.9×10^6	1.22	7.3×10^3	0.92	1.29
Mn-plated	5.4×10^5	1.52	360	6.52	7.44
Ni-plated	6.1×10^6	2.76	2.2×10^3	8.3	8.902
Zn-plated	7.5×10^6	2.37	3.16×10^3	6.2	7.133