

Electronic Supplementary Information

Ultra-high electrical conductivity and superior bendability simultaneously enabled in Ag nanowire based nanocomposites

Minhong He,^{a‡} Xinfang Gao,^{b‡} Bin Liu,^b Jun Zhou^{b*} and Ziqi Liang^{a*}

^a Department of Materials Science, Fudan University, Shanghai 200433, China.

E-mail: zqliang@fudan.edu.cn

^b Center for Phononics and Thermal Energy Science; China-EU Joint Center for Nanophonics and Shanghai Key Laboratory of Special Artificial Microstructure Materials and Technology, School of Physics Science and Engineering, Tongji University, Shanghai 200092, China.

Email: zhoujunzhou@tongji.edu.cn

Experimental

Materials

All the reagents used in the experiments were used without further purification, including Ag NWs (JCNANO Tech Co., Ltd), PVDF (M. W. = 900 kDa, Arkem, Ltd), DMF (J&K Scientific, Ltd).

Methods

A typical fabrication procedure of Ag NWs/PVDF nanocomposites is described as follows. First, 0.1 g PVDF was added into 0.9 g DMF in a 50 mL flask under vigorous stirring at 70 °C for 3 h, followed by room temperature for 24 h. Then different amounts of Ag NWs (5, 10, 15, 20, 30, 40, 50, 60, 70 and 80 wt%) were dispersed into the PVDF solution under mild stirring at room temperature for 1 h. Afterwards, Ag NWs/PVDF bulky nanocomposites were prepared by drop-casting the mixture solution in aluminium molds in a N₂-filled glovebox, followed by drying at 40 °C overnight. These bulky nanocomposites were then peeled off from aluminium molds and then thermal annealed at 135 °C for 30 min.

Characterizations and measurements

Electrical properties of the nanocomposites were measured at room temperature. A four-probe technique was used to measure electrical conductivity on a multimeter (Keithley 2010) and a source meter (Keithley 2400). Field-emission scanning electron microscopy images were acquired on JEOL JSM-6701F at an accelerating voltage of up to 30 kV. X-ray diffraction pattern data for 2θ values were collected with a Bruker AX D8 Advance diffractometer with Ni filtered Cu Kα radiation (λ = 1.5406 Å).

Table S1 The σ value and the film thickness for each Ag NWs fraction

Ag (wt%)	σ (S/cm)	Standard deviation	d (cm)	Standard deviation
5	3.68×10^{-6}	8.62×10^{-8}	0.0088	0.000195
10	1.58×10^{-1}	1.18×10^{-2}	0.0092	0.000210
15	56.5	2.45	0.0050	0.000148
20	3.84×10^2	21.67	0.0076	0.000179

30	4.56×10^2	16.83	0.0068	0.000195
40	5.00×10^2	17.07	0.0060	0.000167
50	1.55×10^3	1.57×10^2	0.0022	0.000126
60	6.49×10^3	2.26×10^2	0.0060	0.000167
70	1.02×10^4	5.13×10^2	0.0042	0.000161
80	1.77×10^4	1.05×10^3	0.0017	0.000100