Supporting Information

Cross-interface energy-filtering effect at organic/inorganic interfaces balances the trade-off between thermopower and conductivity

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Supporting Information A Material preparation

The polyaniline/multiwalled nanotube, called as PANI/MWCNT, was synthesized by the template-assisted in situ growth method. First, the MWCNT network was synthesized by the chemical vapor deposition (CVD) method. The high porosity of MWCNT network, about 99 %, provides the broad regions for the polymerization of PANI. Second, the MWCNT network was fully immersed in precooled 0.02 M aniline solution (50 ml solvent: 40 ml 1 M HCl mixed with 10 ml ethanol, ethanol facilitates soakage of the MWCNT network). Then, the precooled ammonium peroxidisulfate (APS) solution was slowly added dropwise to the aniline solution and the mixture was magnetic stirring for 4 h in an ice bath. Finally, the PANI/MWCNT was washed with deionized water and acetone, and dried in vacuum at 60 °C for 24 h. The PANI content was estimated by identifying the weight variation of MWCNT network before and after polymerization. Seven kinds of PANI/MWCNT were fabricated using different concentrations of aniline (0.0005 M, 0.001 M, 0.0015 M, 0.002 M, 0.005 M, 0.01 M and 0.02 M), in each case aniline and APS were equimolar.

Supporting Information B Raman spectra

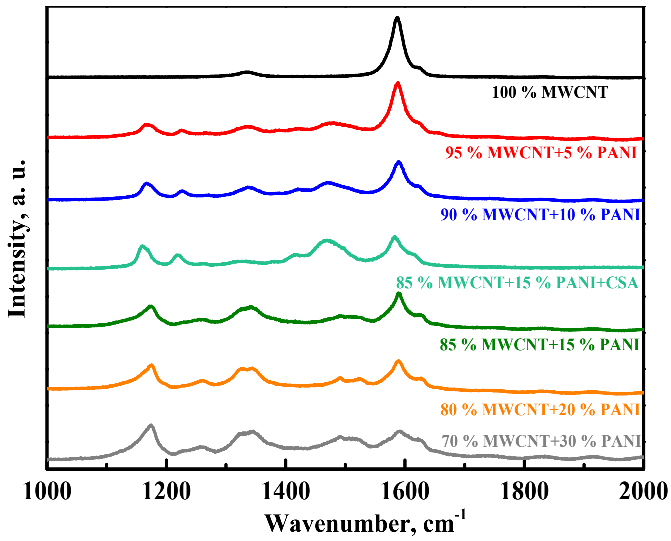

Fig. S1 Raman spectra of the PANI/MWCNT and the PANI-CSA/MWCNT.

Supporting Information C Density of state of MWCNT, PANI and PANI/MWCNT

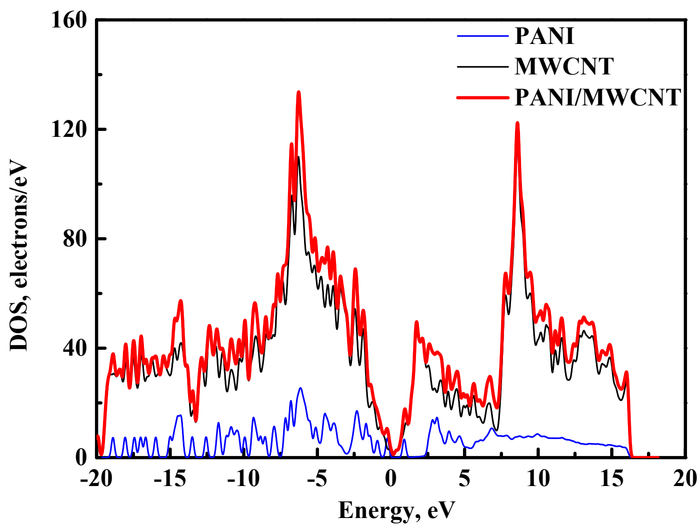

Fig. S2 The DOS of PANI and MWCNT within PANI/MWCNT. The DOS of PANI/MWCNT is also added for comparison.

Supporting Information D Thermal diffusivity and specific heat

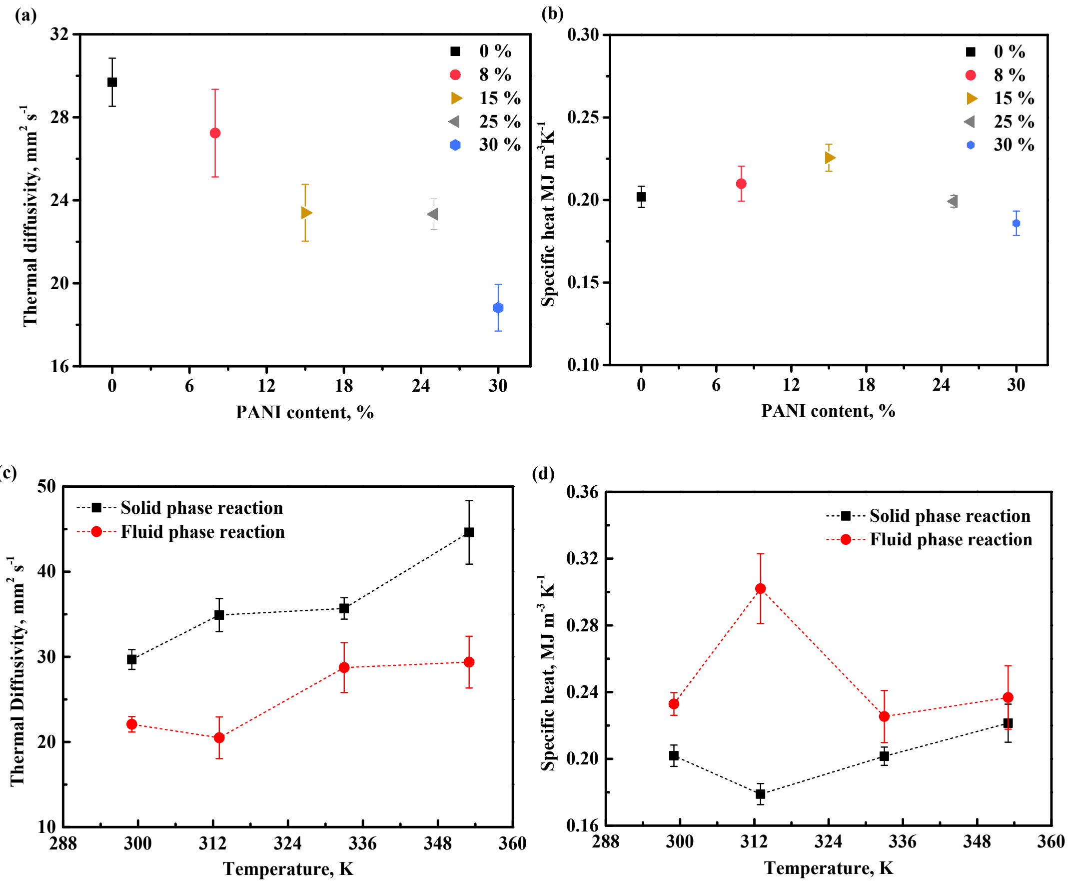

Fig. S3 (a) Thermal diffusivity and (b) specific heat of the PANI/MWCNT as a function of PANI contents. (c) Thermal diffusivity and (d) specific heat of the PANI-CSA/MWCNT as a function of temperature.

Supporting Information E Hall carrier mobility

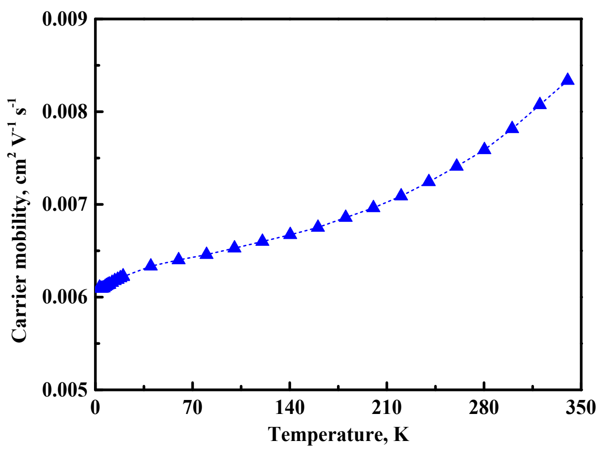

Fig. S4 Temperature-dependent Hall carrier mobility of the PANI /MWCNT at 3 T.

Supporting Information F Kang-Snyder data of pristine PANI

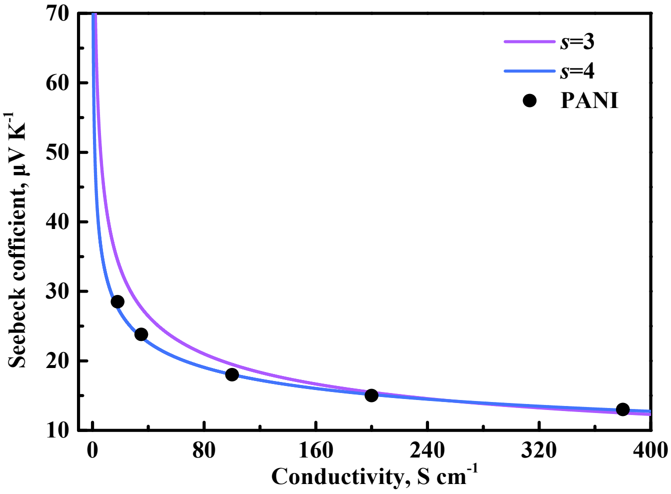

Fig. S5 The Kang-Snyder transport model is used to fit the S-σ curve of the PANI.