

Supplementary Information

Enhanced thermoelectric performance of polyaniline/SWCNT hybrid films by solvent treatment

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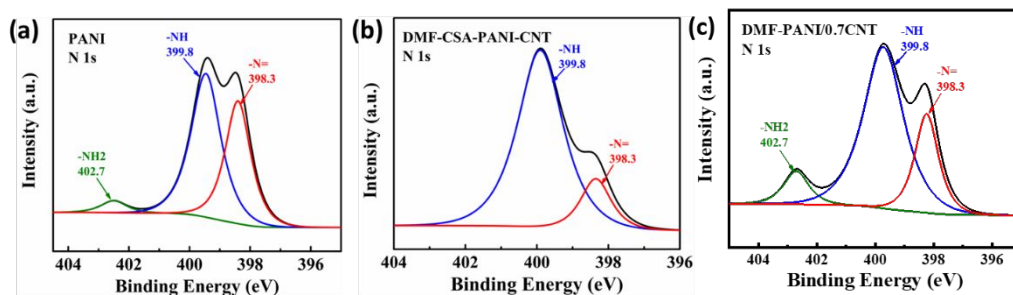


Figure S1. The Photoelectron spectroscopy (XPS) spectra of pure PANI(a) and PANI/0.7CNT films(b) with DMF solvent and undoped PANI/0.7CNT films (c) with DMF solvent.

The photoelectron spectroscopy (XPS) of pure PANI and DMF-CSA-PANI/0.7CNT films is shown in Figure S1. The peaks of -N= and -NH₂ are obviously weakened or even disappeared in (Figure S1a) compared with (Figure S1b). That because camphorsulfonic acid (CSA) is a proton acid, it formed a salt structure with the -NH₂ of PANI when CSA is doped with PANI, so the -NH₂ is greatly reduced. The completely disappearance of the NH₂ peak (Figure S1b) indicates that PANI in the composite films had been completely doped.

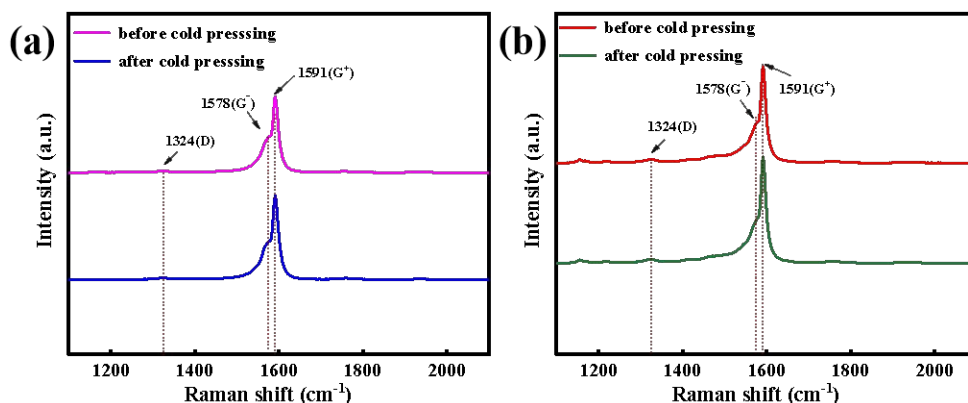


Figure S2. The Raman spectra before and after cold pressing of PANI/0.7CNTs composite films for ethanol solvent(a), and DMF solvent(b).

Figure S2 shows the strong peak at 1591 cm^{-1} , which is the typical peak for the CNT (G-band) and reflects the symmetry and order of the materials. The G peak strength of CNTs decreases in ethanol solvent (Figure S2a). However, in the DMF solvent, the G peak strength of CNTs is relatively high (Figure S2b). The peak of 1324 cm^{-1} is known as the CNT (D-band). The variation trend of D peak is consistent with that of the G peak. Moreover, in the same solvent, the spectrum of the sample before cold pressing does not show obvious changes as compared to that of the composites after cold pressing, implying that the cold pressure treatment in composites will not damage the structure and bring in new defects in PANI/SWCNT network.

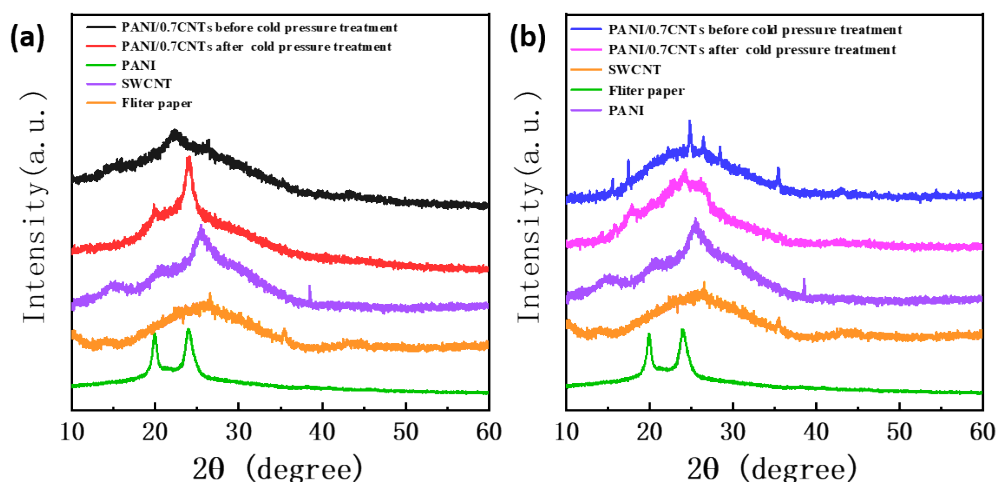


Figure S3. The XRD pattern of PANI/0.7CNT composite films with ethanol solvent(a), DMF solvent (b).

It can be seen from the diagram that the peak of the composite films before pressure treatment is basically amorphous drum. After the pressure treatment, the

characteristic peak strength of the film increases and the peak shape is obvious, which indicates that the cold pressure increases the crystallinity of the films.

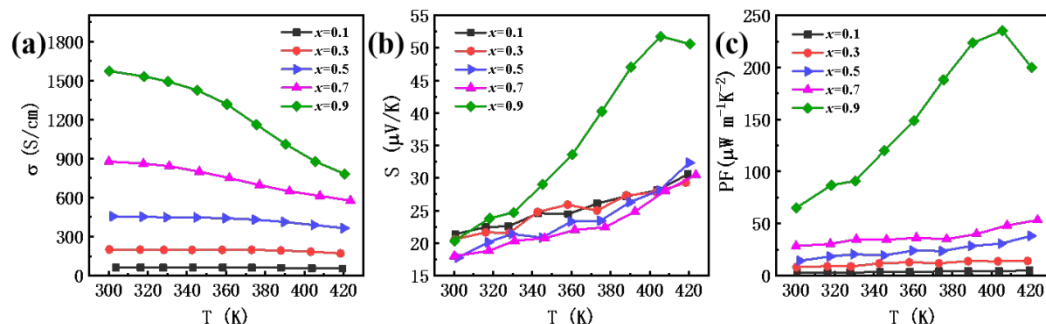


Figure S4. The TE properties depended on temperature of PANI/x CNTs composite films with ethanol solvent before cold pressing treatment, electrical conductivity (a), Seebeck coefficient (b) and power factor (c), x is referred to the content of CNT.

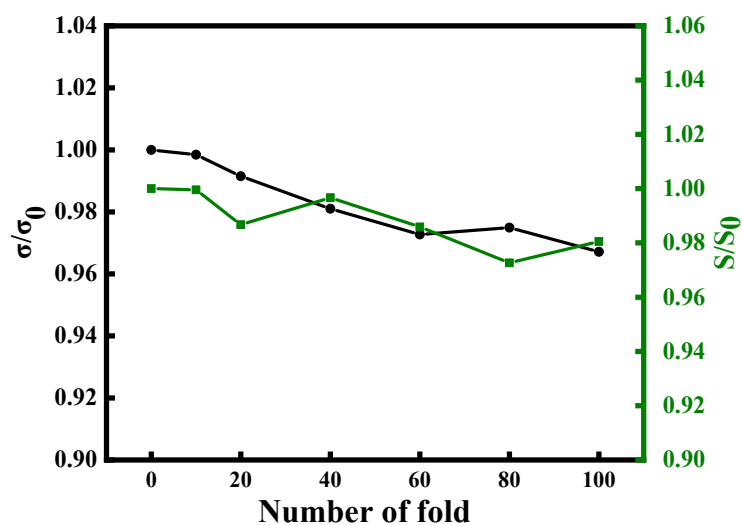


Figure S5. The changes in electrical conductivity and Seebeck coefficient of PANI/0.9 CNTs hybrid films with DMF solvent as a function of blending cycle times.

After 100 times of repeated bending, the electrical conductivity and Seebeck coefficient changed little. These results demonstrated the excellent mechanical stability and flexibility of the composites.