**Supplementary Information**

# Modulation of the doping level of PEDOT:PSS film by treatment with hydrazine to improve the Seebeck coefficeint

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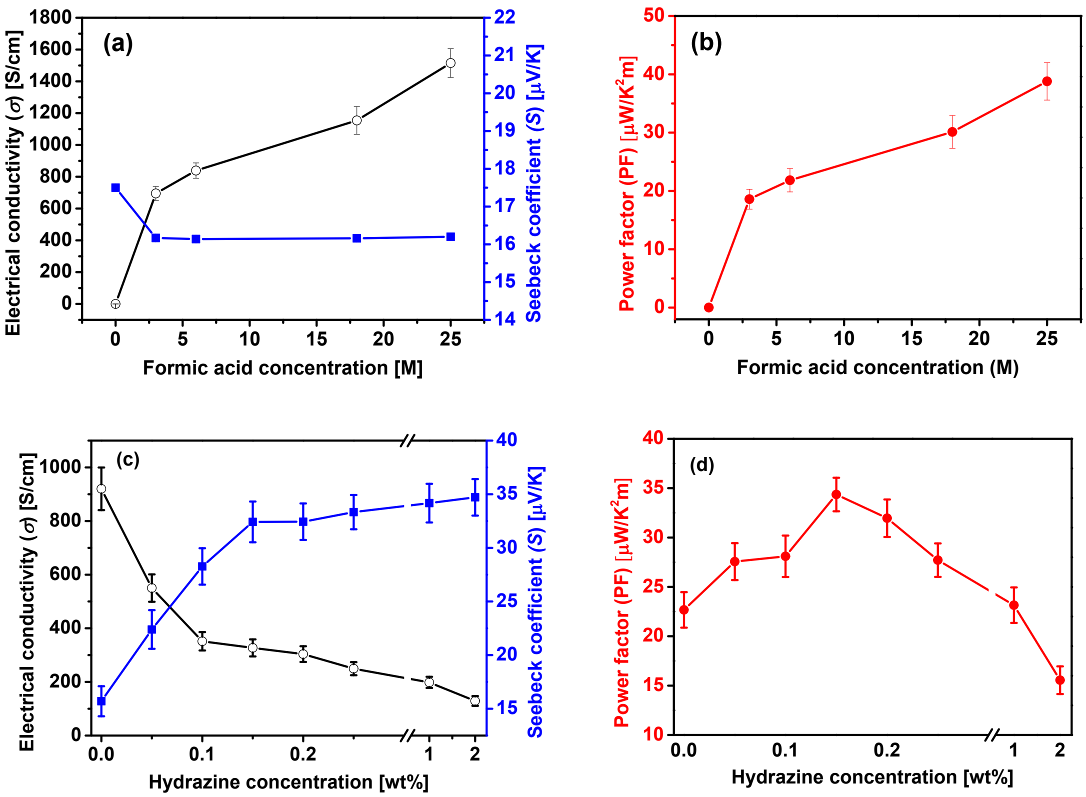


**Figure S1. (a)** Average *σ* and *S* and **(b)** PF of the PEDOT:PSS films treated with different concentrations of formic acid with error bars. The formic acid concentration at 0 refers to the films without formic acid treatment i.e. pristine film. TE properties of the EG treated PEDOT:PSS films as a function of hydrazine weight concentration **(c)** *S* and *σ*, and **(d)** *PF*. The hydrazine concentration at 0 refer to the films without hydrazine treatment, i.e. treated by EG only.

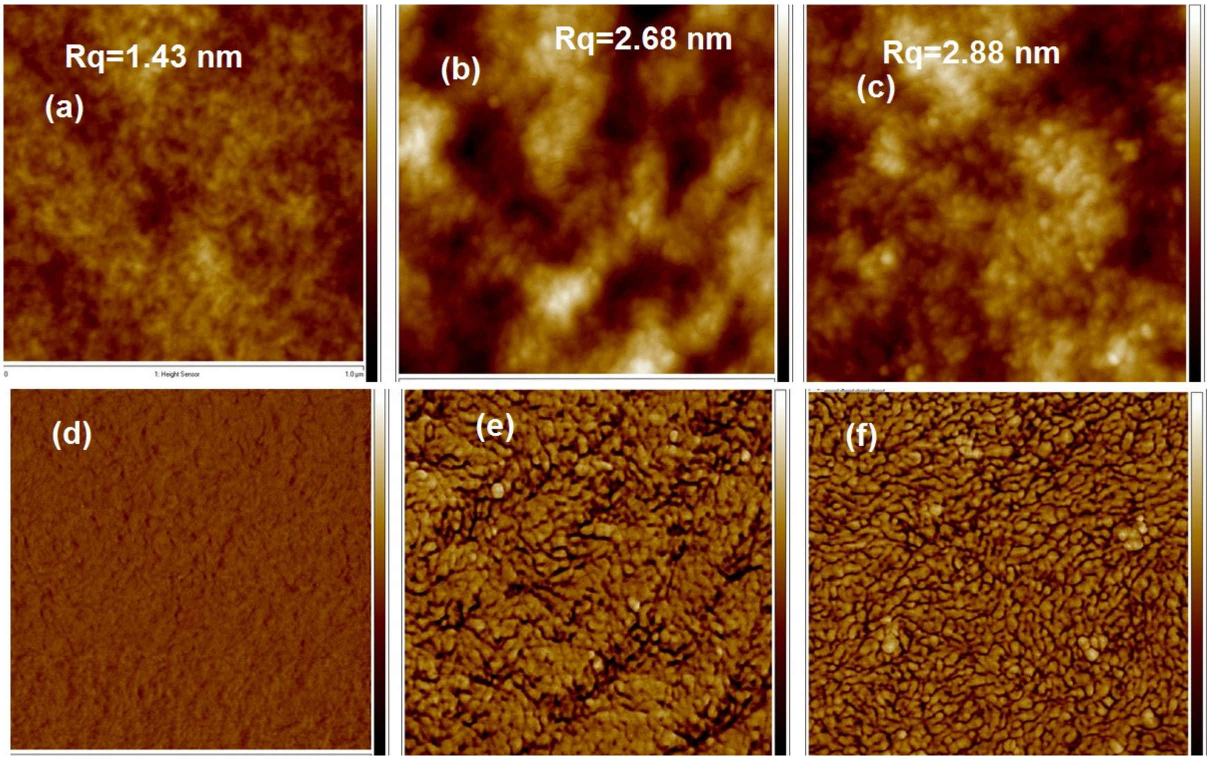


**Figure S2.** AFM height images: **(a)** pristine, **(b)** formic acid/ 0.2 wt % hydrazine treated and **(c)** formic acid/ 1 wt % hydrazine treated. AFM Phase images: **(d)** pristine, **(e)** formic acid/ 0.2 wt % hydrazine treated and **(f)** formic acid/ 1 wt % hydrazine treated. All images captured with an area of 1×1 μm$^2$.

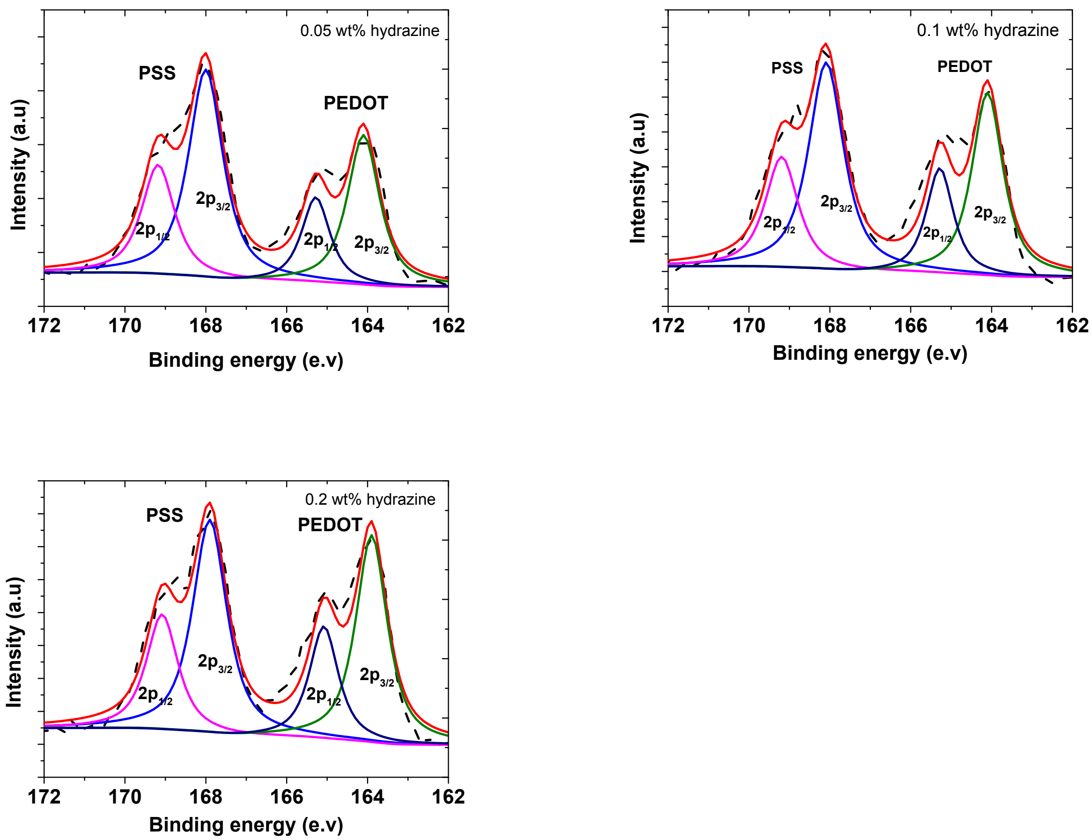


**Figure S3**. XPS spectra of (a) 0.05 wt% hydrazine, (b) 0.1 wt% hydrazine and (c) 0.2 wt% hydrazine treated PEDOT:PSS films.

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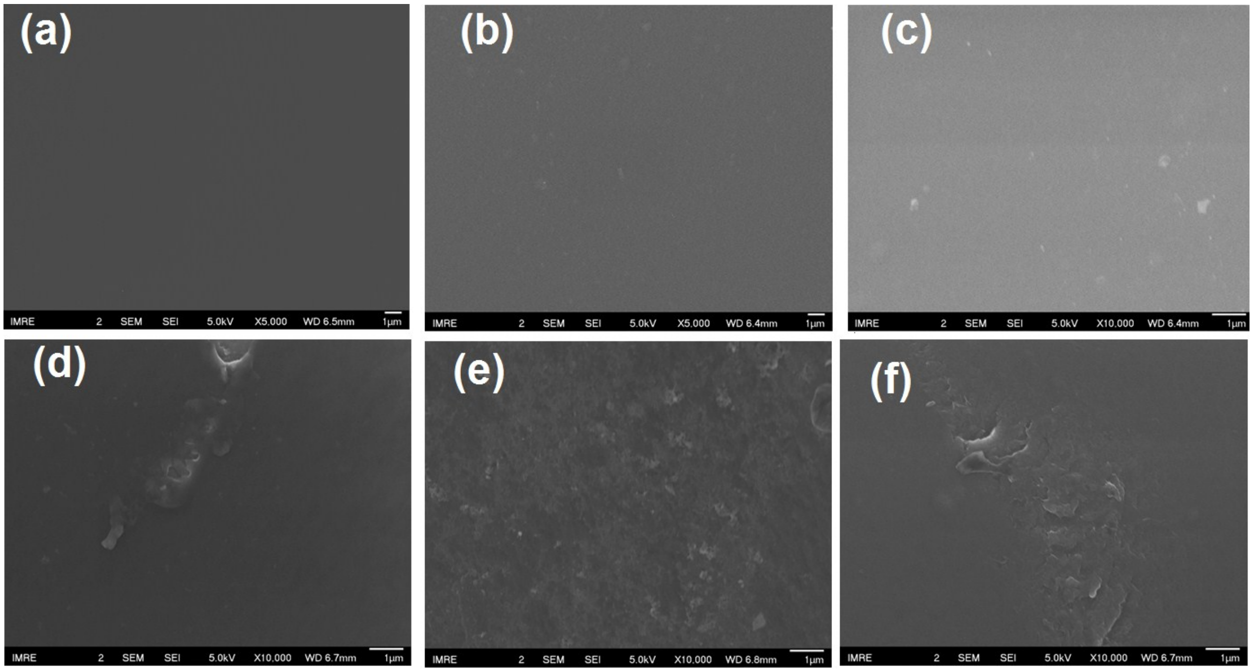


**Figure S4.** SEM images: **(a)** pristine, **(b)** formic acid 1 time treated **(c)** formic acid three times treated **(d)** formic acid-0.15wt% hydrazine pristine, **(e)** formic acid/ 2 wt % HZ treated and **(f)** EG/ 0.15 wt % HZ treated. All images captured an area of 1×1 μm$^2$.

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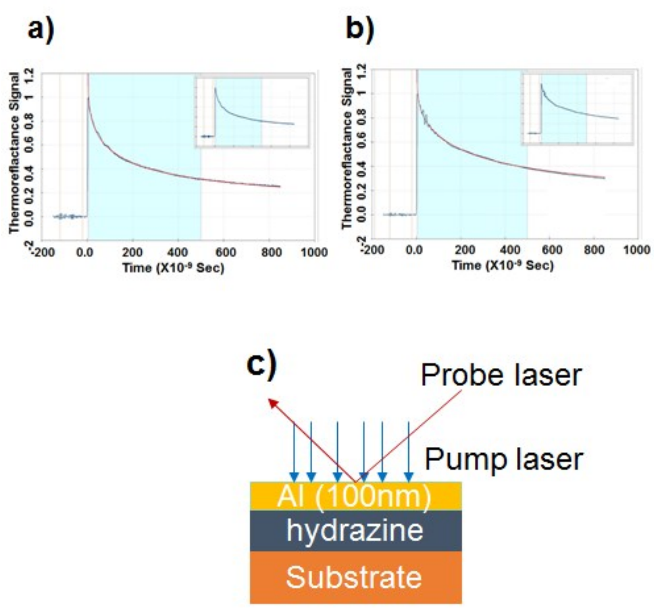


**Figure S5. (a)** The pristine and **(b)** treated PEDOT:PSS films normalized thermalreflectacne signals. The films coated with 100 nm-thick-Al after the nanosecond-pulse heating. The solid red lines represent the fitted temperature response curve that is used to extract the thermal effusivity of the PEDOT:PSS films and **(c)** The front heating, front detecting configuration used in the measurement text of the article should appear here with headings as appropriate.

**Table S1.** Treatment methods of some of PEDOT:PSS TE materials and their corresponding TE properties reported in the literature.

| Reference | Treatment methods | ***σ*** (S/ cm) | ***S*** (μV/ K) | ***PF*** (μW/mK²) | ***k*** (W/mK) | ***ZT*** |
|---|---|---|---|---|---|---|
| [1] | Post-treatment with DMSO/EG mixture | 952.8 | 19.0 | 37.1 | 0.17 | 0.065 |
| [2] | Dipping post-treatment H2SO4 | 1,167 | 12.1 | 17.0 | - | - |
| [3] | N,N-Dimethylformamide solution of Zinc chloride post treatment | 1400 | 26.1 | 98.2 | - | - |
| [4] | D-sorbitol addition , then vapor posttreatment with TDAE | 295 | 27.5 | 22.3 | | 0.01 |
| [5] | Urea addition | 63.1 | 20.7 | 2.7 | - | - |
| [6] | Formic acid post treatment | 1,900 | 20.6 | 80.6 | - | - |
| [7] | Treated with hydrazine | 578 | 67.0 | 112.0 | 0.37 | 0.093 |
| This work | Treated with formic acid and hydrazine | 513 | 42.7 | 93.5 | 0.30 | 0.10 |

## References


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