Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

Vapor phase synthesized Poly(3,4-ethylenedioxythiophene)-trifluoromethanesulfonate as a transparent conductor material

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VPP Parameter investigation

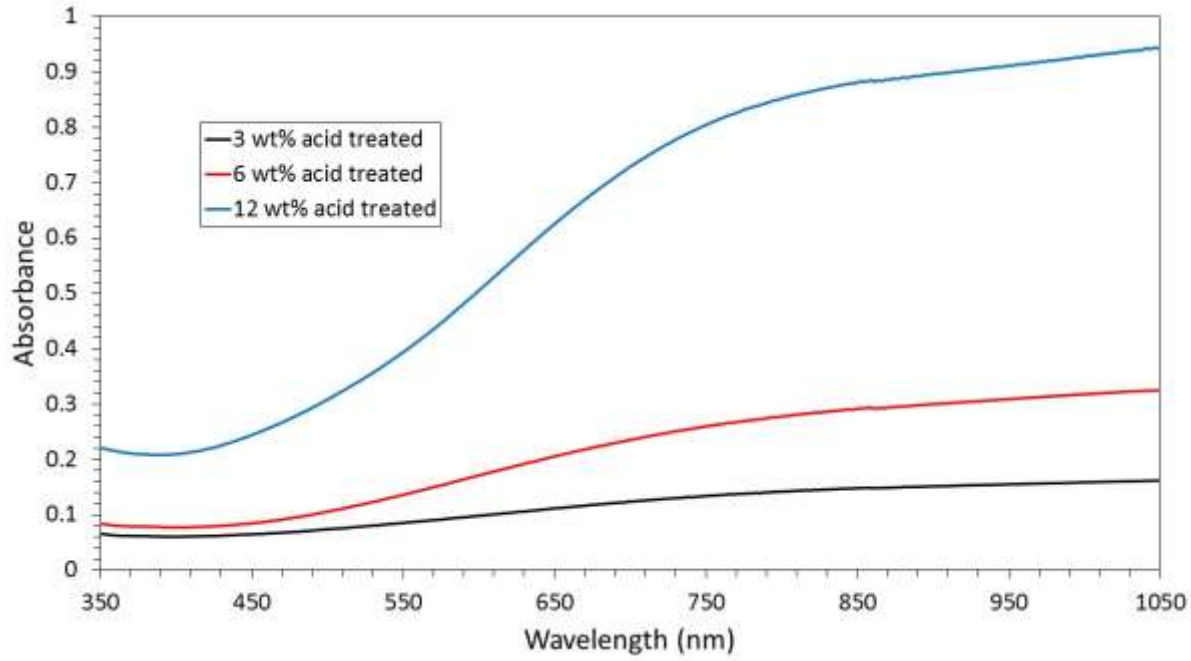


Figure SI1. UV-Vis spectra of the oxidant concentration variation acid treated films

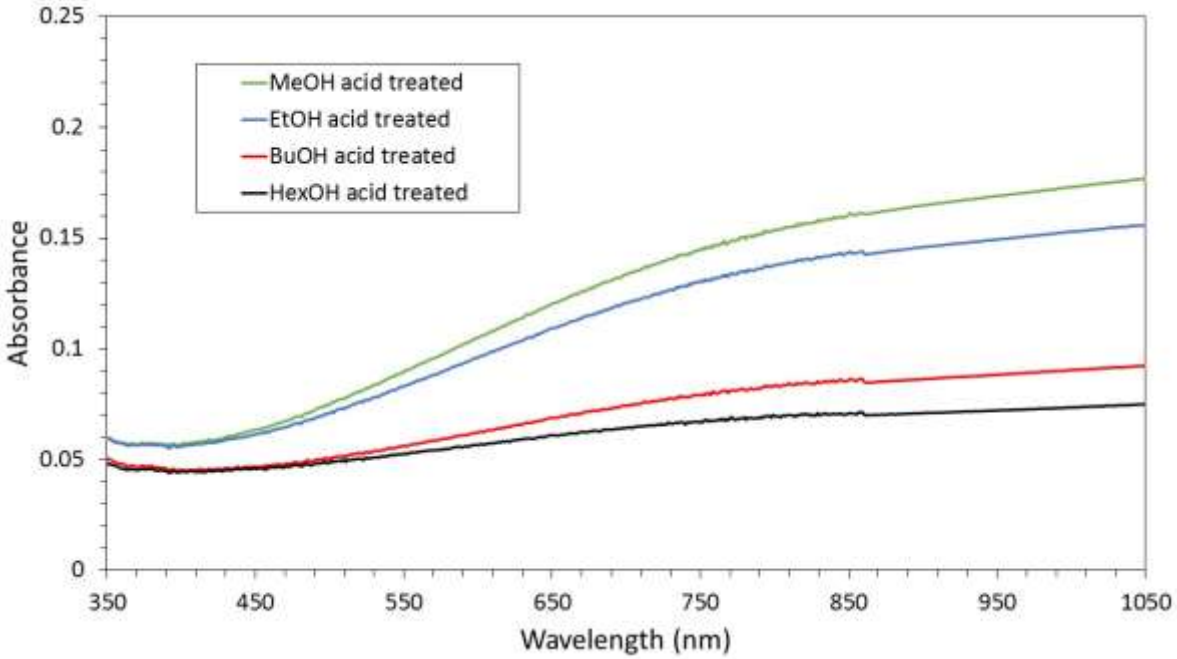
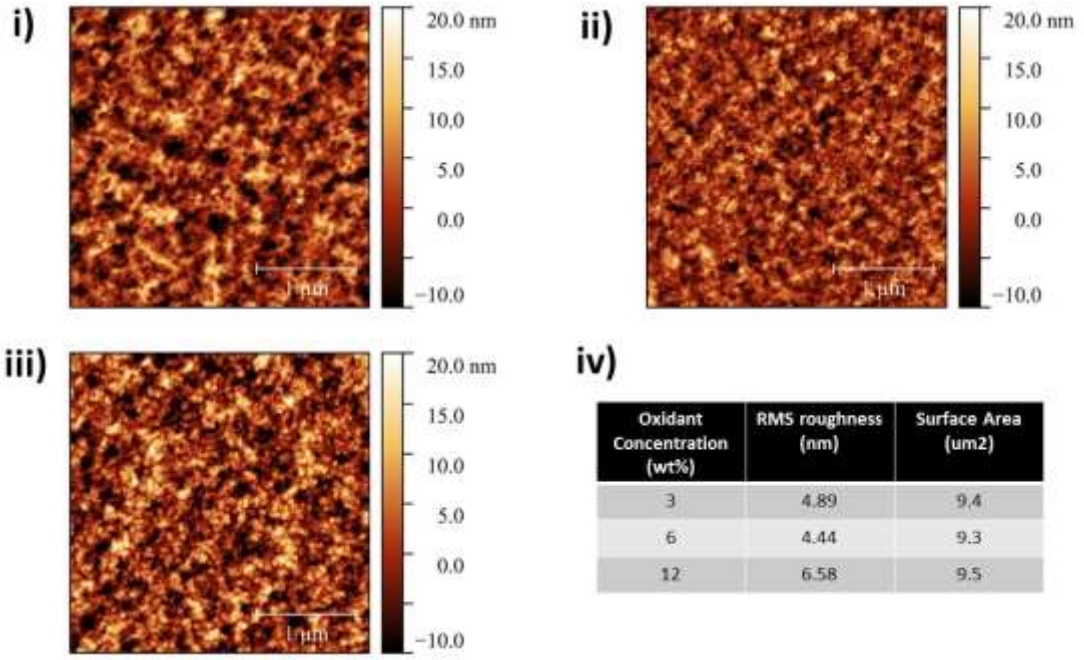
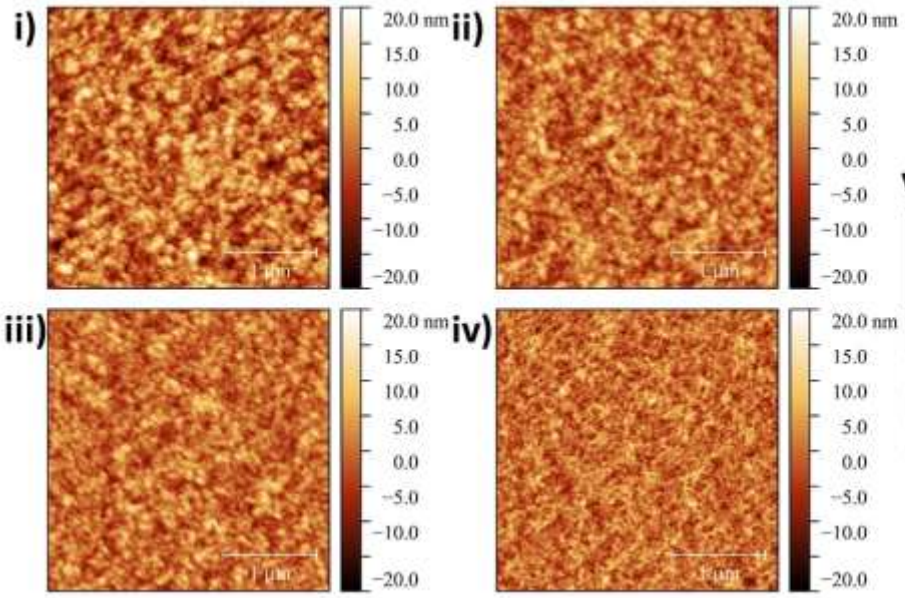


Figure SI2. UV-Vis spectra of the solvent variation acid treated films.



Oxidant Concentration (wt%)	RMS roughness (nm)	Surface Area (um2)
3	4.89	9.4
6	4.44	9.3
12	6.58	9.5

Figure SI3. Topographical atomic force microscope images of PEDOT:OTf at various oxidant concentrations. i) 3 wt%, ii) 6 wt% and iii) 12 w% together with the surface characteristics in iv).



v)

Solvent	RMS roughness (nm)	Surface Area (μm^2)
Methanol	5.27	9.3
Ethanol	4.2	9.3
Butanol	3.8	9.2
Hexanol	3.95	9.5

Figure SI4. Topographical atomic force microscopy images of PEDOT:OTf using various alcoholic based solvents. I) Methanol, ii) Ethanol, iii) Butanol and iv) Hexanol together with the surface characterizations in v).

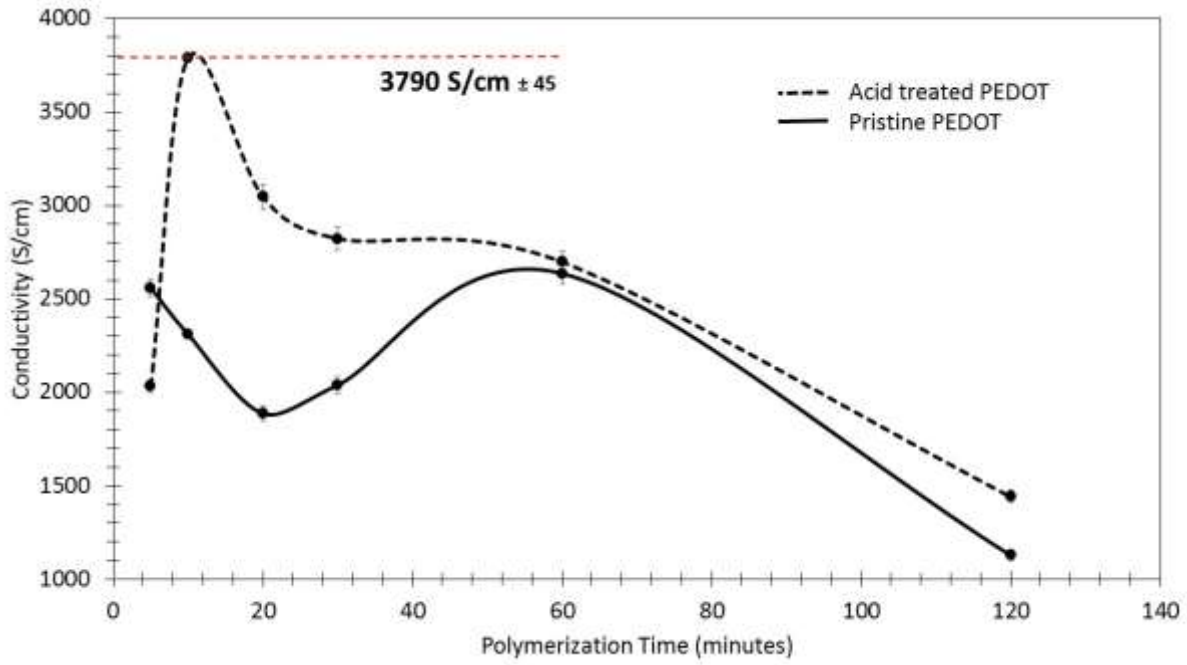


Figure SI5. VPP of EDOT using an oxidant solution composed of 3 wt% $Fe(OTf)_3$ and 20 wt% in ethanol where the polymerization time was varied and temperature set at 60 °C

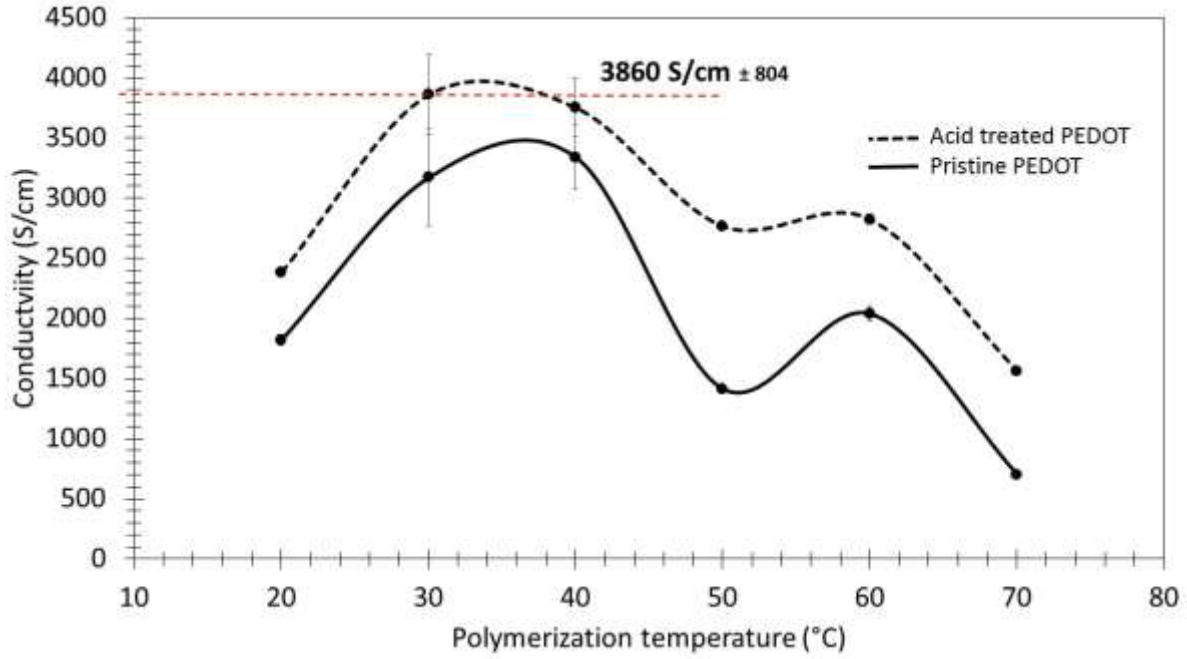


Figure SI6. VPP of EDOT using an oxidant solution composed of 3 wt% $Fe(OTf)_3$ and 20 wt% in ethanol where the polymerization temperature was varied and the polymerization time set at 30 minutes.

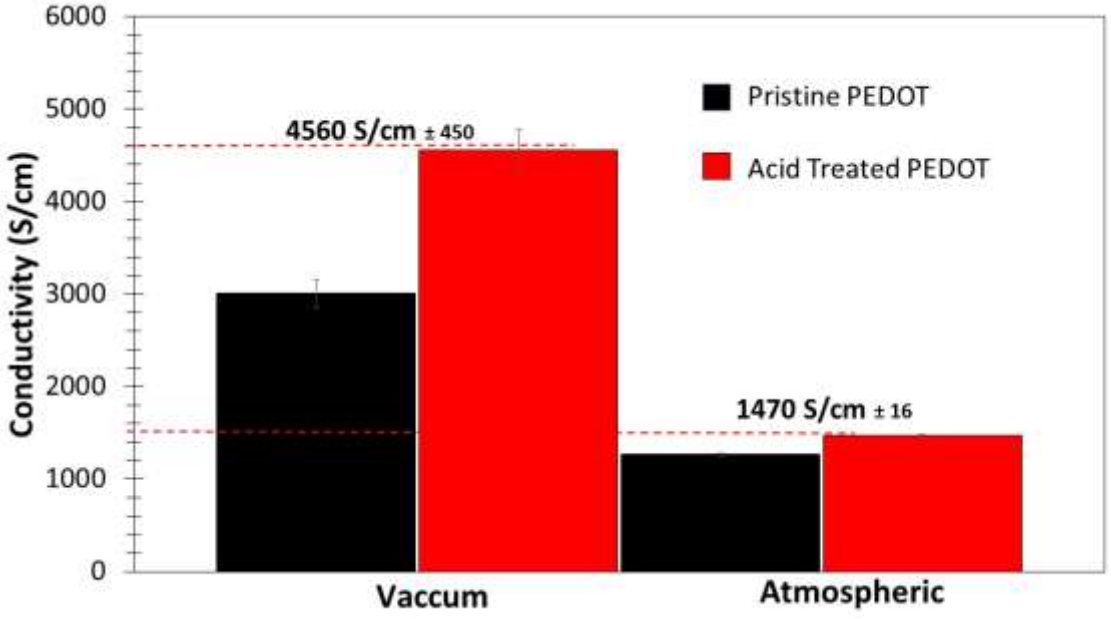


Figure SI7. Influence of vacuum conditions on the electrical conductivity of the optimised PEDOT:OTf thin films before and after acid treatment.

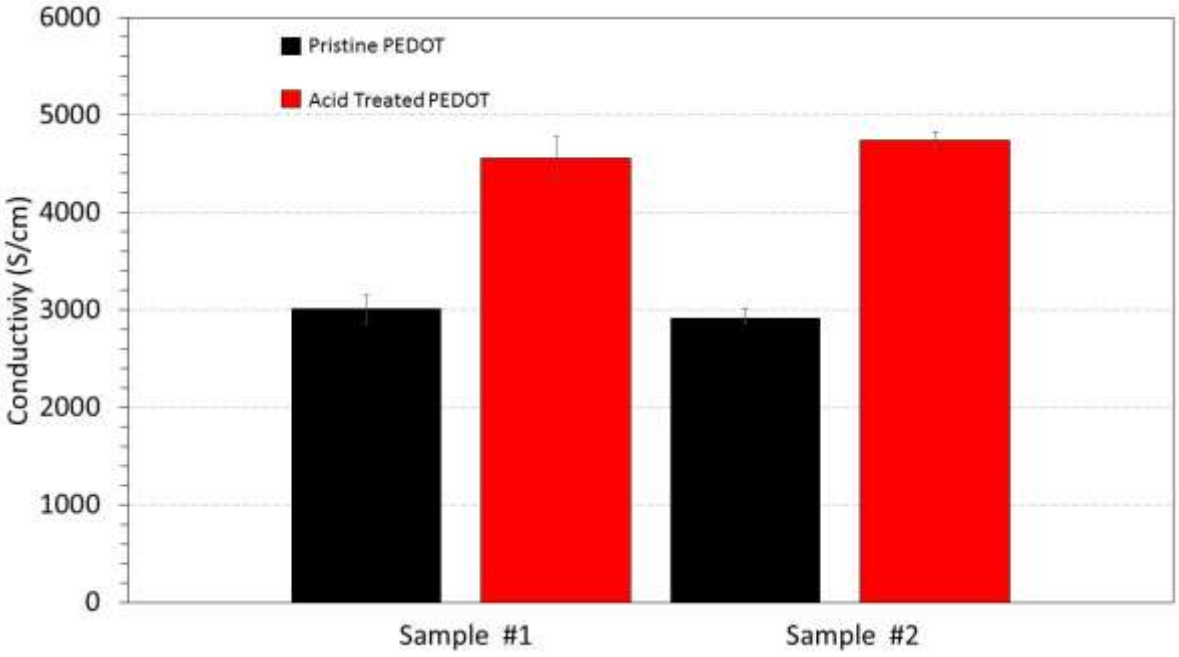


Figure SI8. Sample reproducibility within the VPP of EDOT using the optimized conditions and parameters for $Fe(OTf)_3$ oxidant species.

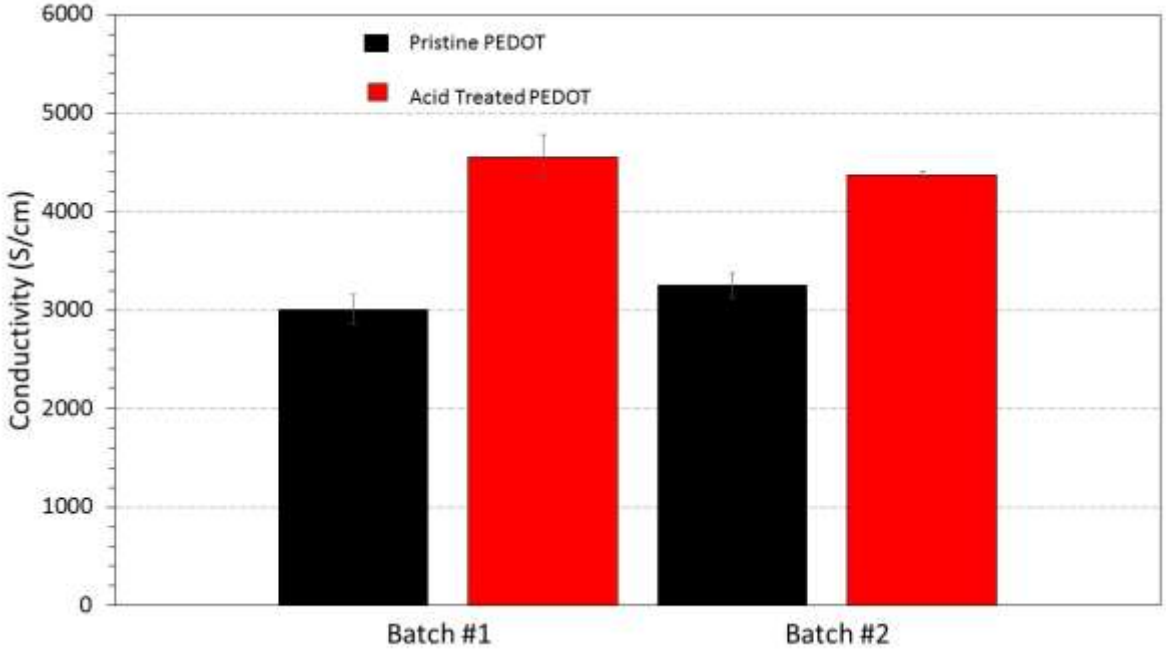


Figure SI9. Sample reproducibility within the VPP of EDOT using the optimized conditions and parameters for $Fe(OTf)_3$ oxidant species between batches. Batch #1 was synthesized for 30 minutes and the following day Batch #2 was synthesized.

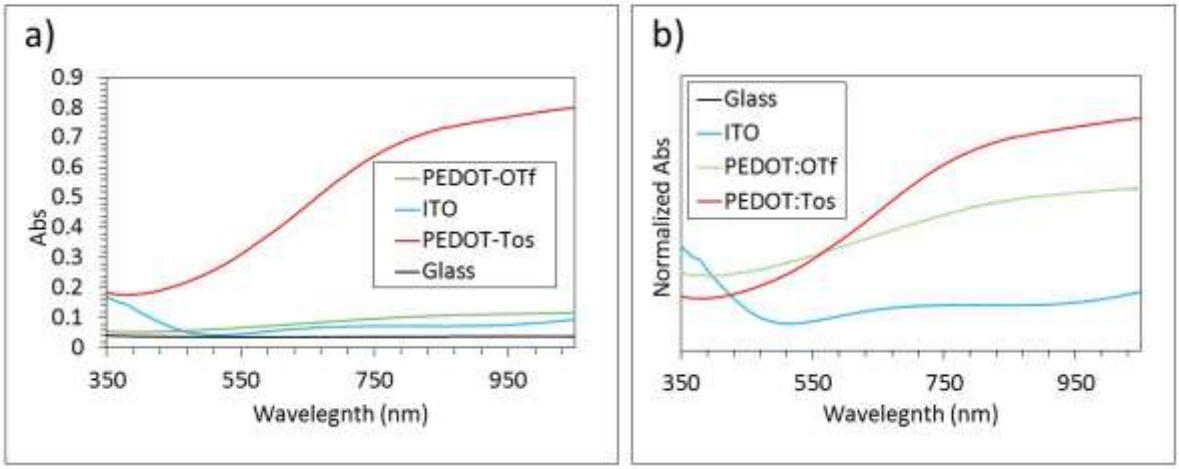


Figure SI10. a) Absorbance data and b) normalized absorbance to thickness of glass, ITO, PEDOT:Tos and PEDOT:OTf.

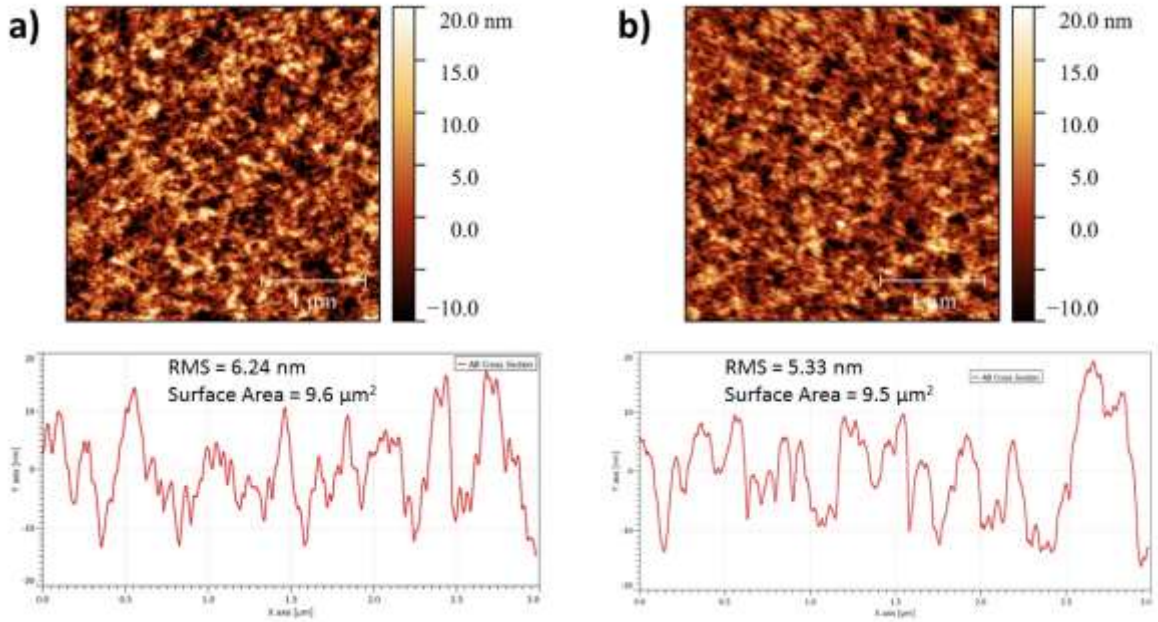


Figure SI11. PEDOT:OTf thin films morphology of a) pristine film (before acid treatment) and b) after acid treatment. Graphs show the cross section of the AFM images.

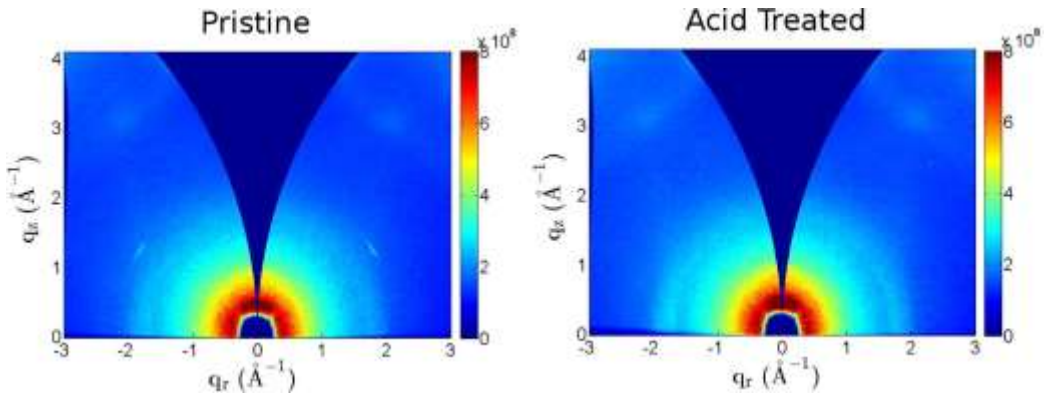


Figure SI12. 2D GIWAXS images for the pristine and acid treated films

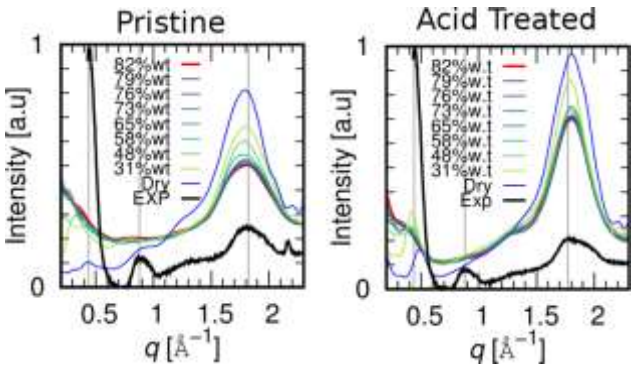


Figure SI13. X-Ray Diffraction Patterns calculated on both simulated pristine and acid treated films for different solvent contents.

Anion	Van der Waals Volume (A^3)	Minimal Projection radius (A)	Maximal Projection radius (A)
HSO_4^-	61.9	2.9	3.2
Oft	85.2	3.0	3.4

Table SI1. Table showing the Van der Waals Volume, minimal and maximal projection radius calculated by MarvinSketch 18.16.