Supplementary Information

All-Dry, One-step Synthesis, Doping and Film Formation of Conductive Polypyrrole

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Table S1. Detailed experimental condition of PPy synthesis using oCVD outlining deposition temperature (Ts), reactor net pressure during deposition (Pr), oxidant and monomer flow rates in sccm and also mol min^{-1}, saturation pressure of the oxidant and monomer, partial pressures, diluent (N_2) flow rates, and surface availability of oxidant to monomer in mol/mol and based on pressure C_{ox}/C_{mo}*:

$$* Cox/Cmo = \frac{\left(\frac{P}{Psat}\right)SbCl5}{\left(\frac{P}{Psat}\right)Pyrrole}$$

		$SbCl_5$					Pyrrole							
Ts (°C)	P_r (mTorr)	Flow rate (sccm)	Flow rate (mol/min)	P (mTorr)	P^{sat} (mTorr)	P/P^{sat}	Flow rate (sccm)	Flow rate (mol/min)	P (mTorr)	P sat (mTorr)	P/P^{sat}	N_2 flow rate (sccm)	$SbCl_5$ /Pyrrole (mol/mol)	C_{ox}/C_{mo}
20	1000	1.25	0.009	250	2285	0.109	2.5	0.036	500	4184	0.119	1.25	0.272	0.91
40	1000	1.25	0.009	250	5299	0.047	2.5	0.036	500	14218	0.03	1.25	0.272	1.34
60	1000	1.25	0.009	250	11106	0.022	2.5	0.036	500	41717	0.011	1.25	0.272	1.87
80	1000	1.25	0.009	250	21405	0.011	2.5	0.036	500	108350	0.004	1.25	0.272	2.53
40	200	1.25	0.009	50	5299	0.009	2.5	0.036	100	14218	0.007	1.25	0.272	1.34
40	300	1.25	0.009	75	5299	0.014	2.5	0.036	150	14218	0.010	1.25	0.272	1.34
40	500	1.25	0.009	125	5299	0.023	2.5	0.036	250	14218	0.017	1.25	0.272	1.34
40	1000	1.25	0.009	250	5299	0.047	2.5	0.036	500	14218	0.035	1.25	0.272	1.34
40	300	0.25	0.001	15	5299	0.002	2.5	0.036	150	14218	0.010	2.25	0.054	0.26
40	300	0.5	0.003	30	5299	0.005	2.5	0.036	150	14218	0.010	2	0.109	0.53
40	300	1.25	0.009	75	5299	0.014	2.5	0.036	150	14218	0.010	1.25	0.272	1.34
40	300	1.25	0.009	75	5299	0.014	1.25	0.018	75	14218	0.005	2.5	0.545	2.68

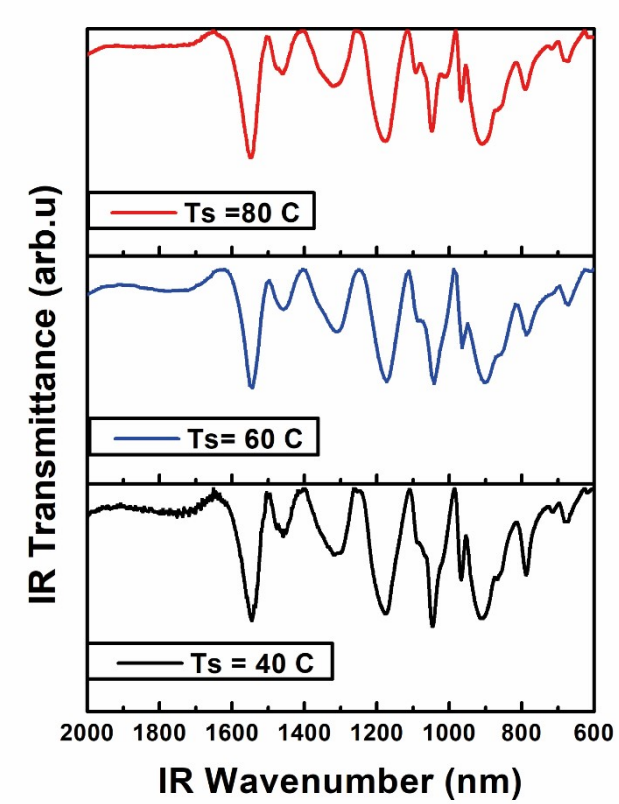

Figure S1. FTIR spectra of PPy thin films deposited at different temperatures

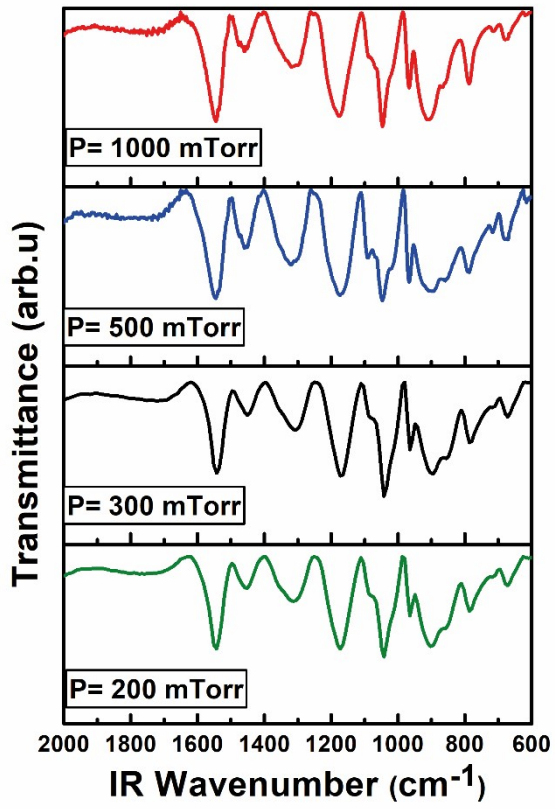

Figure S2. FTIR spectra of PPy thin films deposited at different pressures

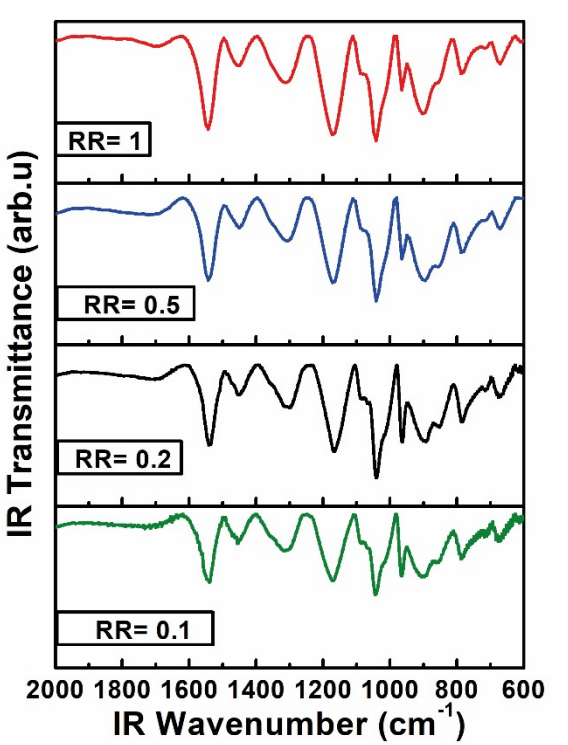

Figure S3. FTIR spectra of PPy thin films deposited at different oxidant to monomer (RR) ratios

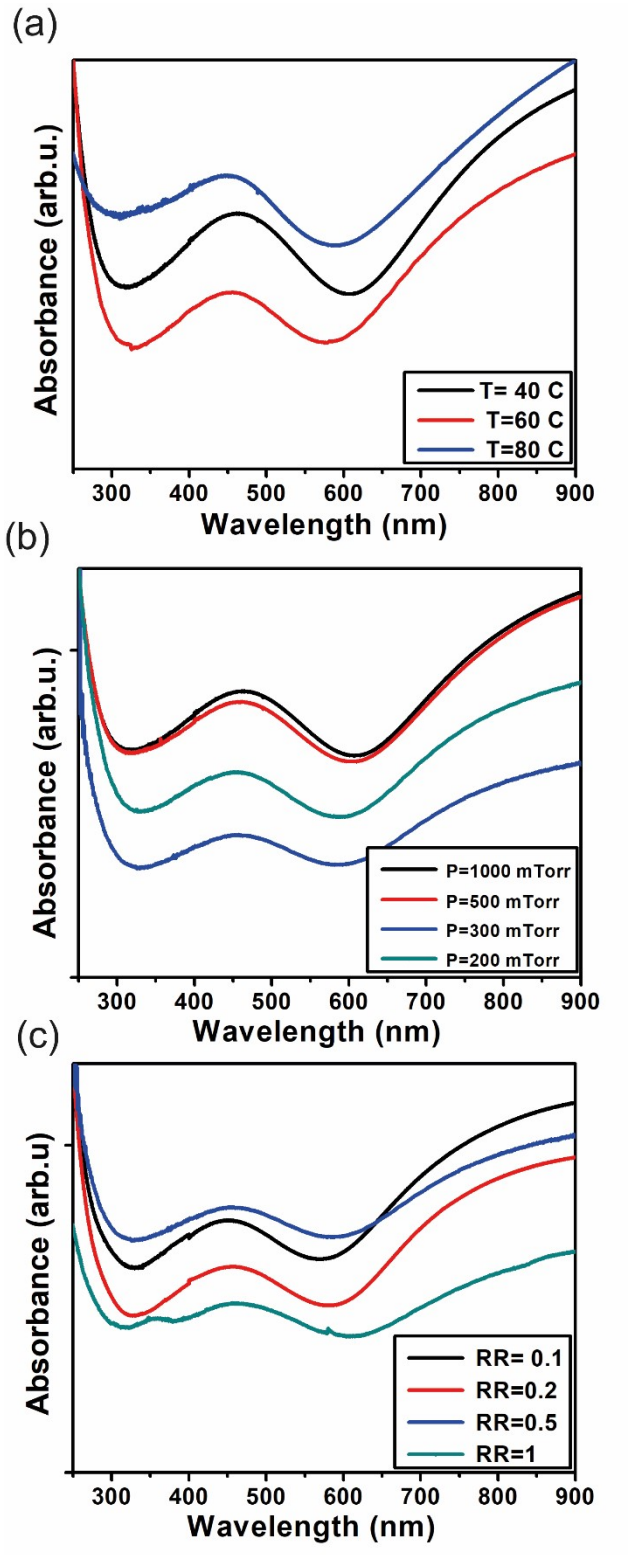

Figure S4. UV-vis spectra of PPy thin films deposited at (a) different temperatures, (b) different pressures and (c) different oxidant to monomer (RR) ratios

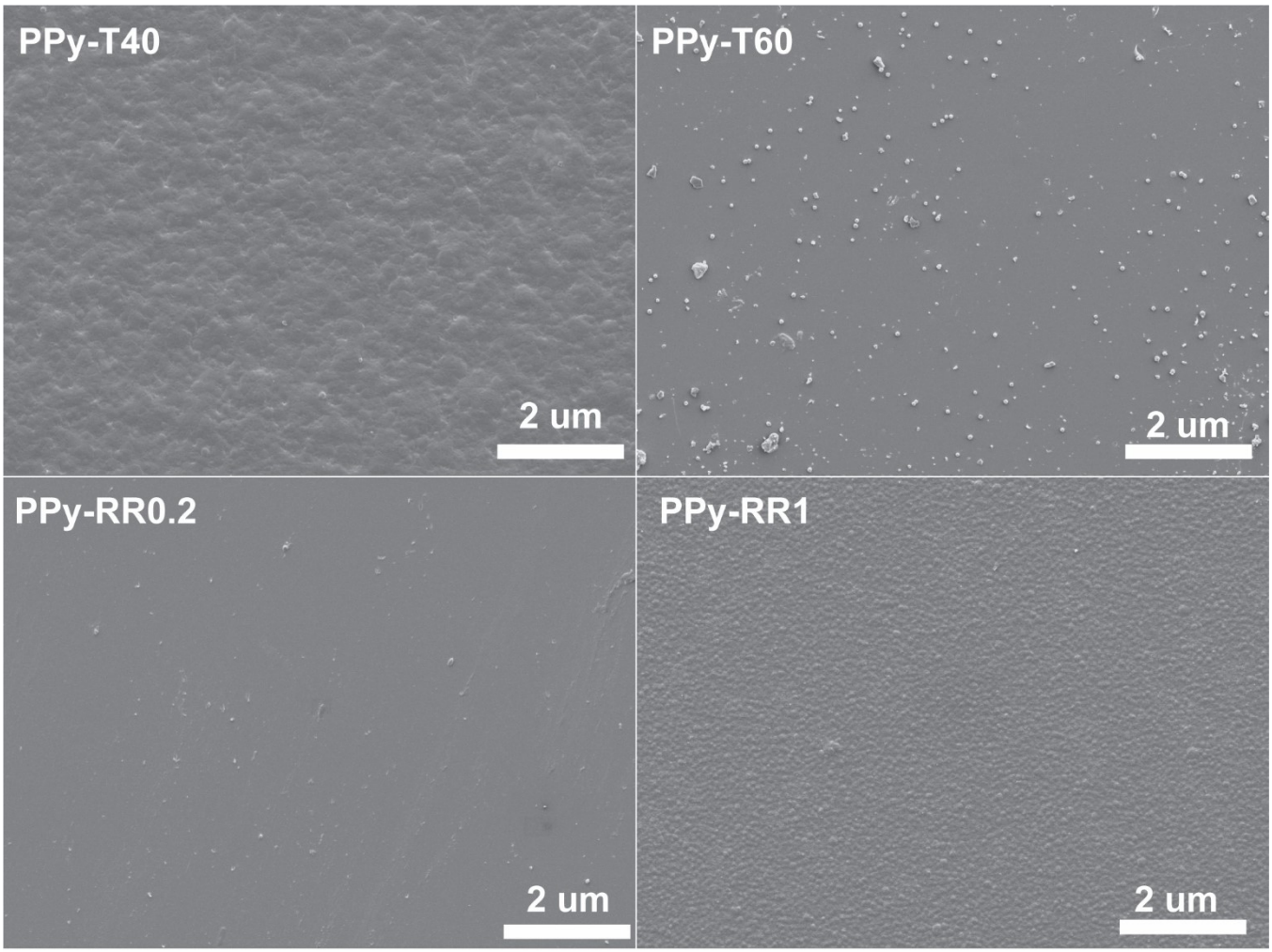

Figure S5. Comparison of the surface morphology of PPy films deposited at different temperature or with oxidant to monomer ratio: SEM micrographs of PPy-T40 and PPy-T60 (top); PPy-RR0.2 and PPy-RR1 (bottom).

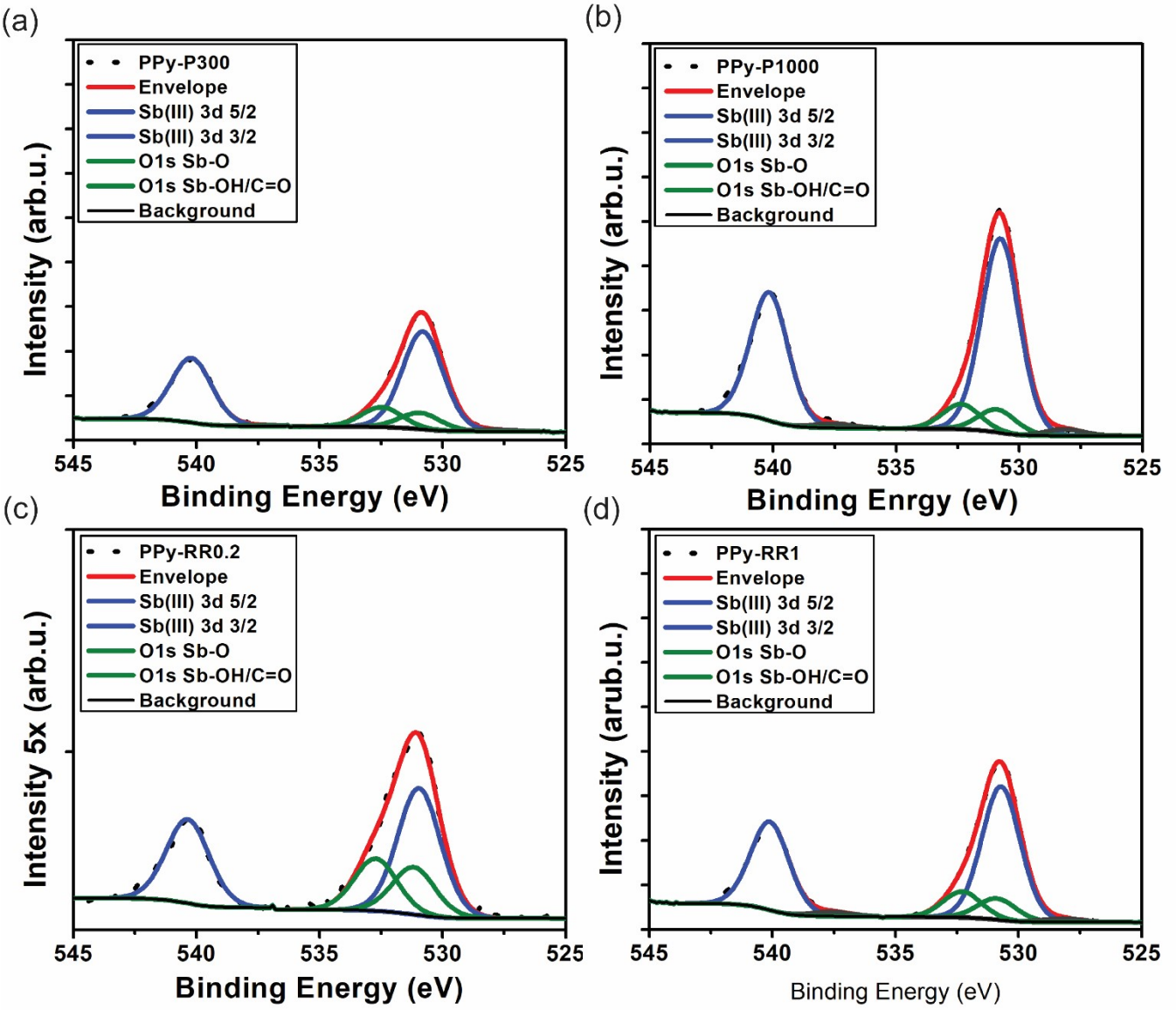

Figure S6. XPS spectra of the Sb 3d and O1s core level regions: (a) PPy-P300, (b) PPy-P1000 (=PPy-RR0.5), (c) PPy-RR0.2, and (d) PPy-RR1

Table S2. Chemical environments of antimony and oxygen as identified from the Sb 3d and O1s XPS spectra of PPy films synthesized at different pressure and with different oxidant to monomer ratio .

Chemical Environment	Relative contribution to the total spectral intensity of the Sb3d or O1s core level line (%)				Binding Energy (eV)
	PPy-P300	PPy-P1000	PPy-RR0.2	PPy-RR1	
Sb (III) 3*d*	47.4	57.8	31.3	70.8	530.8
Sb (0) 3*d*	1.0	2.0	0	2.8	527.8
O1*s* (Sb-O)	23.3	19.1	33.7	6.6	531
O1*s* (C=O)	28.3	21.1	35	19.8	532.5