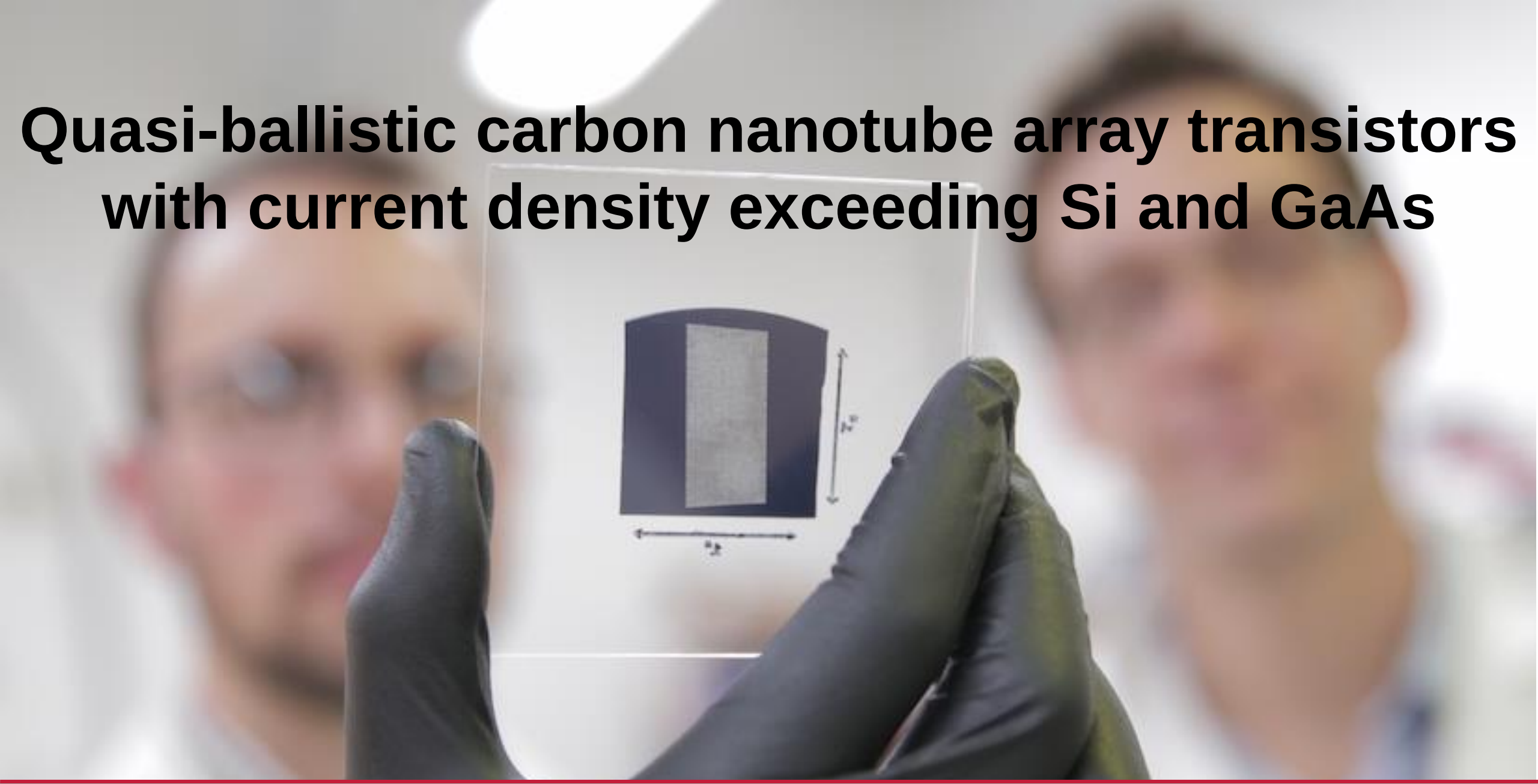
Quasi-ballistic carbon nanotube array transistors with current density exceeding Si and GaAs



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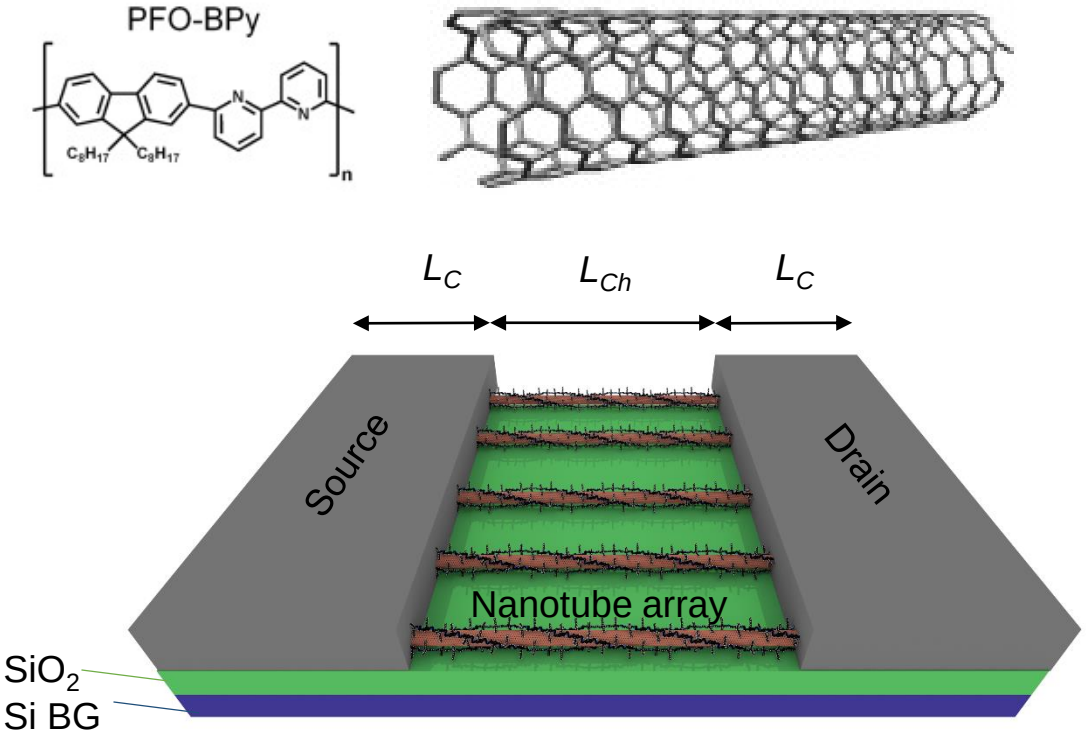
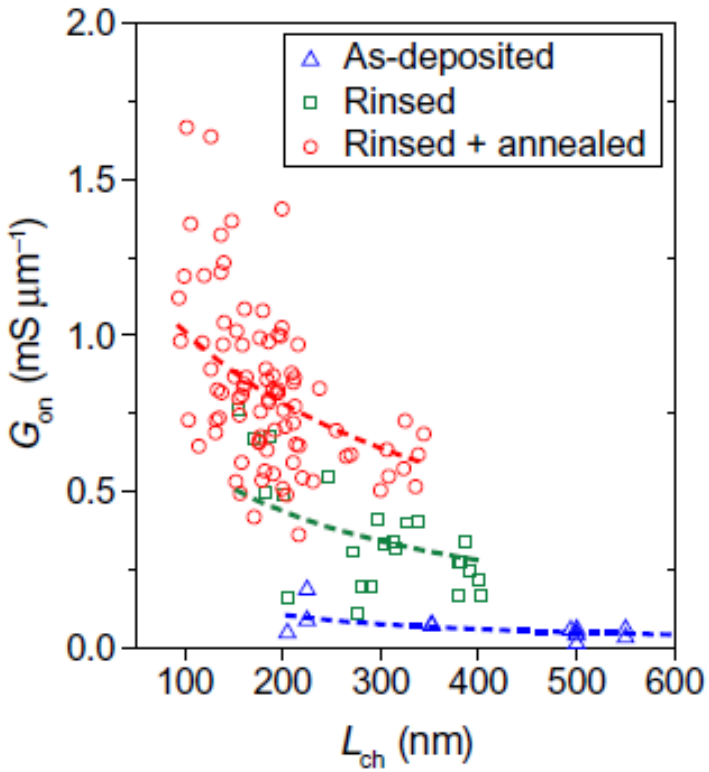
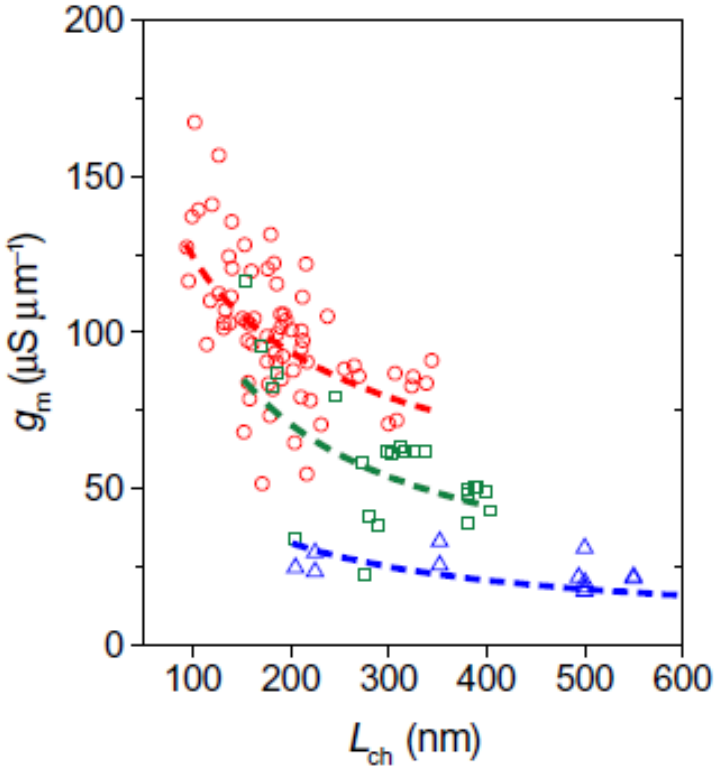
How XPS helped us create state-of-the-art carbon nanotube array transistors



Brady et al. Science Advances (2016)



On state conductance improved by 7x



Transconductance improved by 3x

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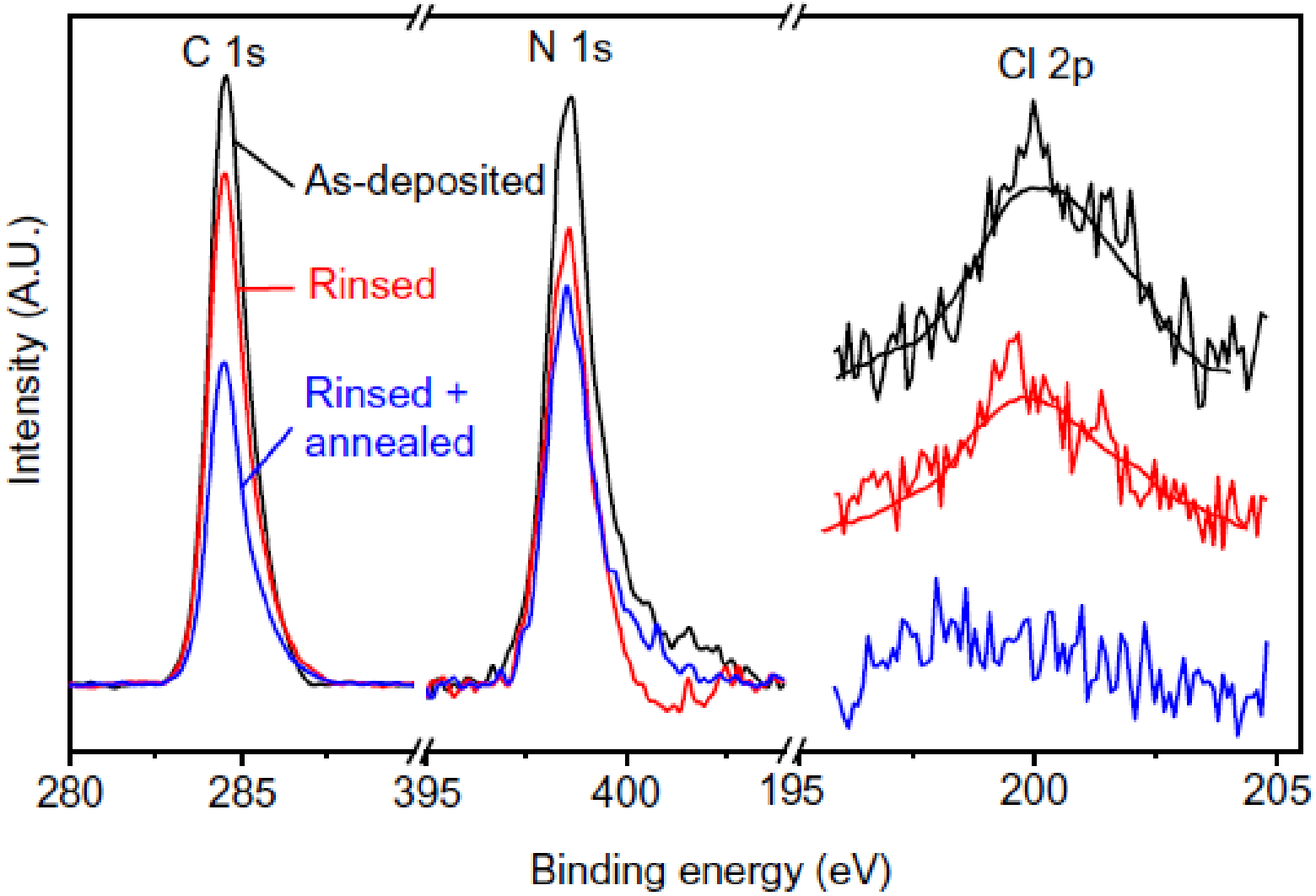

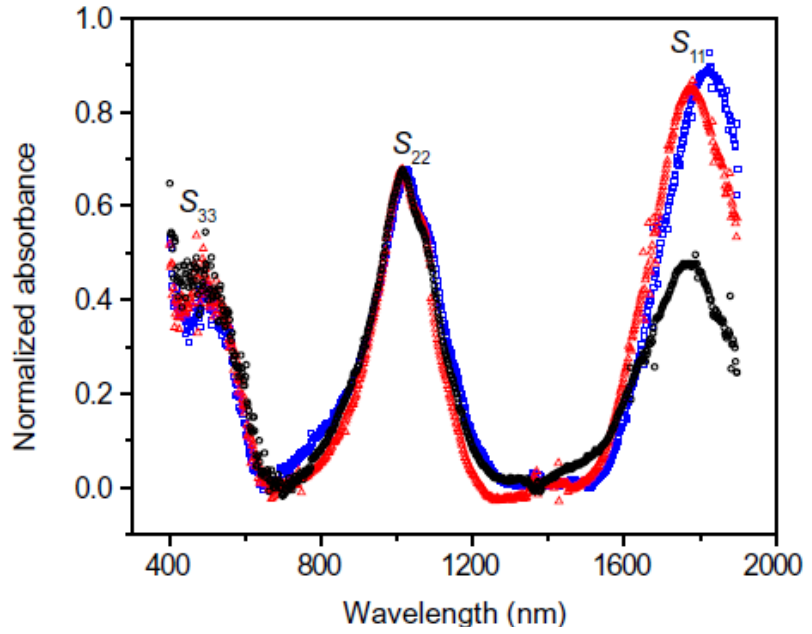

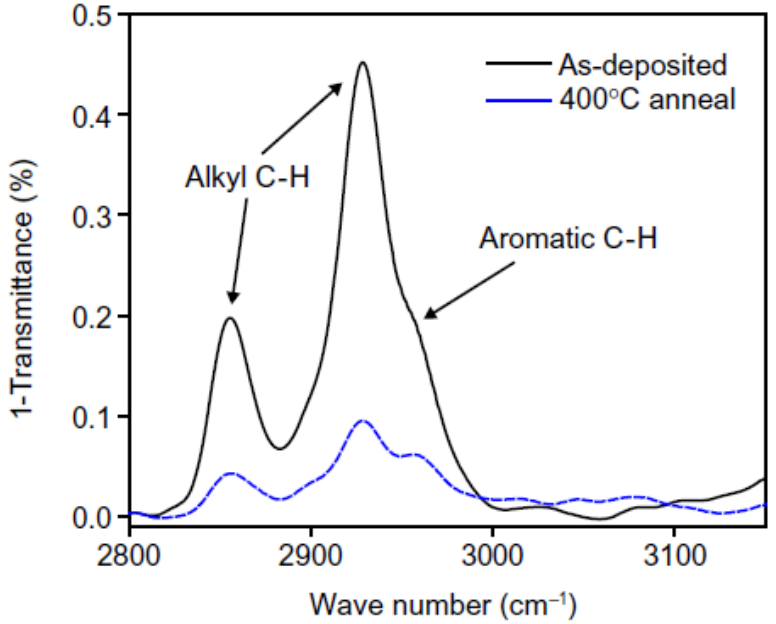

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	Total C* (10^{15} atoms cm^{-2})	C from PFO-BPy inferred from N density (10^{15} atoms cm^{-2})	Total N* (10^{13} atoms cm^{-2})	Total Cl (10^{13} atoms cm^{-2})
		C from sources other than PFO-BPy (10^{15} atoms cm^{-2})		
As-deposited	2.68 ± 0.12	1.25 ± 0.06	6.41 ± 0.28	1.67 ± 0.46
		1.43 ± 0.10		
Rinsed	2.45 ± 0.16 (*RR* = 8.5 ± 2.5%)	1.14 ± 0.03 (*RR* = 8.9 ± 3.2%)	5.83 ± 0.18 (*RR* = 8.9 ± 3.2%)	0.77 ± 0.02 (*RR* = 53.8 ± 5.2%)
		1.31 ± 0.12 (*RR* = 8.0 ± 2.3%)		
Annealed	1.83 ± 0.18 (*RR* = 31.8 ± 5.4%)	0.61 ± 0.36 (*RR* = 50.7 ± 0.9%)	5.57 ± 0.33 (*RR* = 12.6 ± 1.7%)	~0 (*RR* = ~100%)
		1.22 ± 0.14 (*RR* = 15.1 ± 10.0%)		
Rinsed + Annealed	1.62 ± 0.05 (*RR* = 33.7 ± 2.5%)	0.53 ± 0.01 (*RR* = 57.8 ± 1.4%)	4.8 ± 0.09 (*RR* = 25.1 ± 2.53%)	~0 (*RR* = ~100%)
		1.1 ± 0.04 (*RR* = 23.1 ± 2.9%)		

$$N_i = \frac{A_i}{A_{Si}} \frac{S_{Si}}{S_i} \times \left(sin(\theta) \times \lambda_{Si,SiO2} \times \rho_{Si,SiO2} \right)$$

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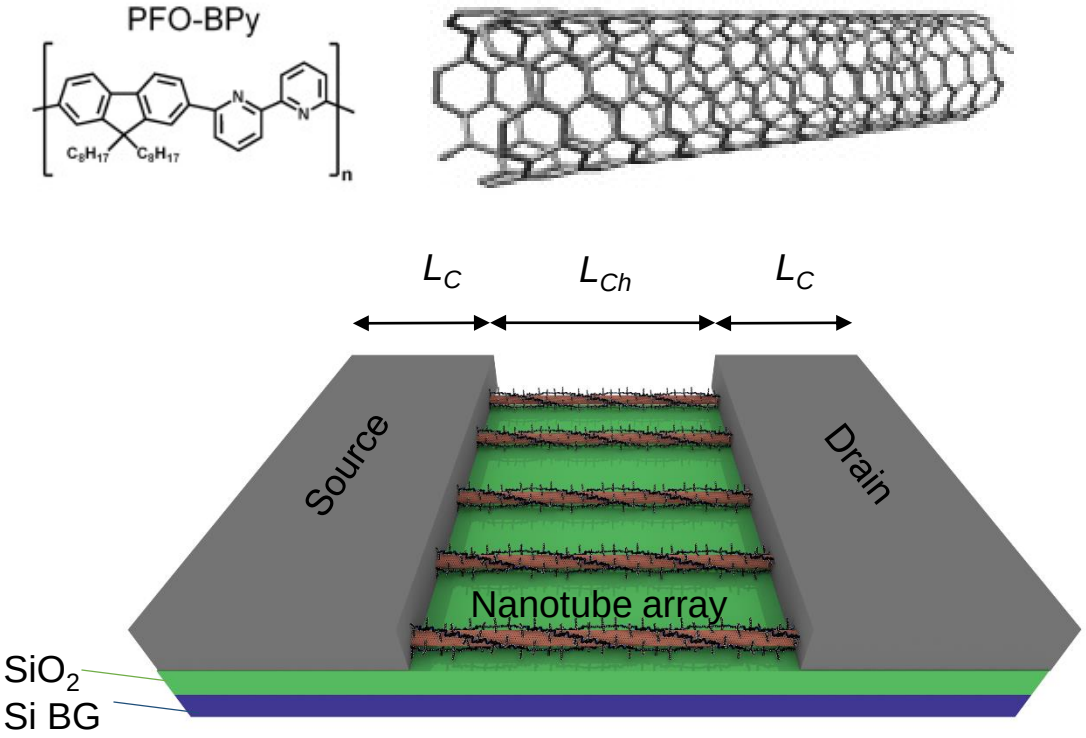

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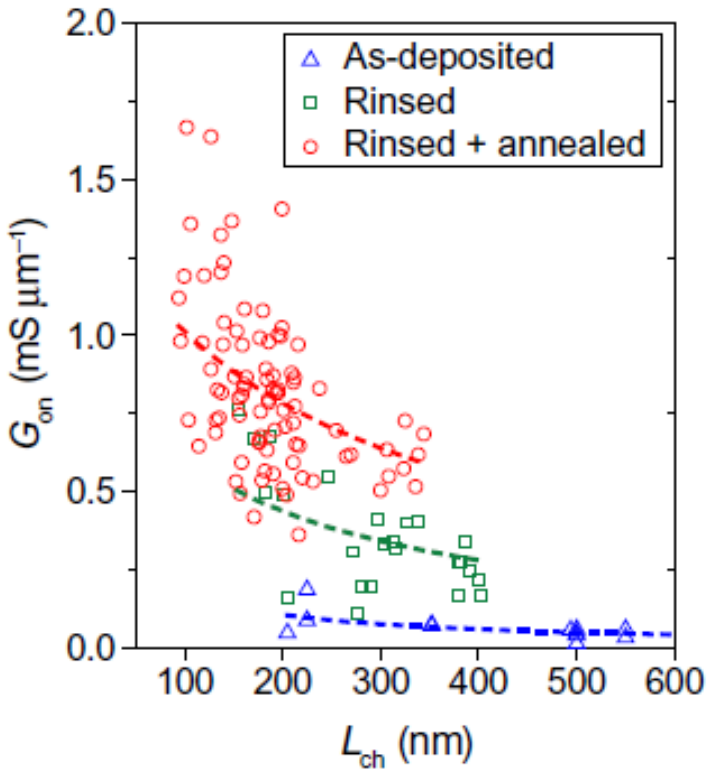

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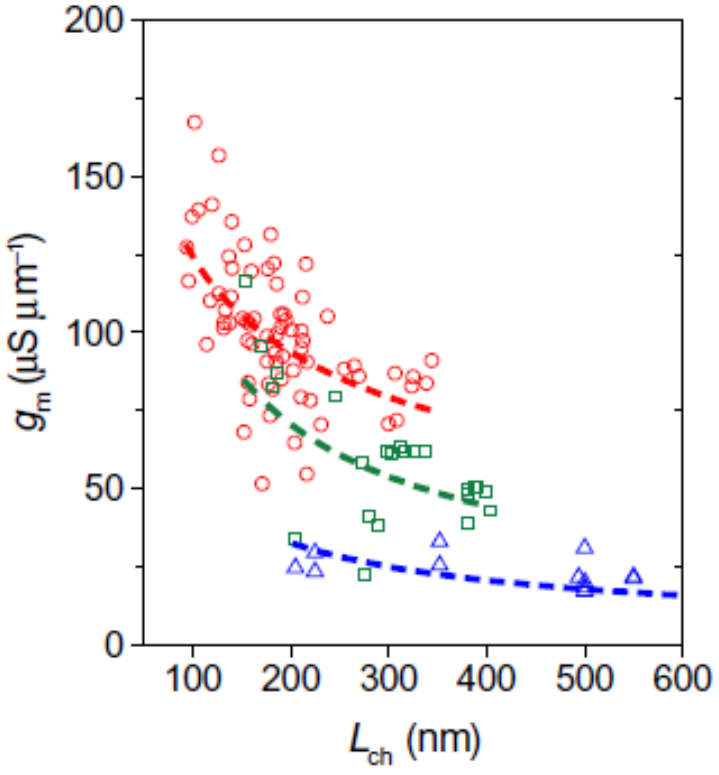

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