Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Support information

Scalable Exfoliation and Dispersion of Two-Dimensional Materials----An Update

Hengcong Tao,[1] Yuqin Zhang,[1] Yunnan Gao,[1] Zhenyu Sun,[1,*] and John Texter[2,*]

[1] State Key Laboratory of Organic-Inorganic Composites, Beijing University of Chemical Technology, Beijing 100029, China. Corresponding email: sunzy@mail.buct.edu.cn; jtexter@emich.edu

[2] School of Engineering Technology, Eastern Michigan University, Ypsilanti, MI 48197, USA

Table S1 Comparison of 2D material dispersions in solvents

2D materials	Solvent	Exfoliation condition	Concentration (mg mL^{-1})	Dimension	Raman	Ref.
Graphene	NMP	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	~ 0.01	Thickness: single layer (12%)	N/A	[1]
		Bath ultrasonication: 150 W, 6 h; CF: 500 rpm, 45 min	~ 2	Thickness: ~3 layers Lateral size: ~1 μm	$I_d/I_g < 0.5$	[2]
		C_I: 3 mg mL^{-1}; Bath ultrasonication: 80 W, 30-500 min; CF: 500 rpm, 30 min	~ 1.75	N/A	$I_d/I_g \approx 0.5$	[3]
		C_I: 3.3 mg mL^{-1}; Bath ultrasonication: 0.5-2 h;	~ 1.25	N/A	$I_d/I_g \approx 0.57$	[4]

		CF: 500 rpm, 45 min				
		C_I: 1 wt% Bath ultrasonication: 100W, 6 h; CF: 8000 g, 60 min	$(86 \pm 1.0) \times 10^{-3}$	Thickness: 1-6 layers Lateral size: 224 ± 50 nm	I_d/I_g = 0.6-1.0	[5]
		C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(4.7 \pm 1.9) \times 10^{-3}$	N/A	N/A	[6]
	IPA	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(3.1 \pm 1.0) \times 10^{-3}$	N/A	N/A	[6]
		C_I: 3.3 mg mL^{-1}; Bath ultrasonication: 16 W, 48 h; CF: 500, 2000, 5000 rpm, 45 min	~ 0.5	Thickness: < 5 layers	N/A	[7]
	Acetone	C_I: 3.3 mg mL^{-1}; Bath ultrasonication: 16 W, 48 h; CF: 500, 2000, 5000 rpm, 45 min	~ 0.08	N/A	I_d/I_g = 0.14	[7]
		C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(1.2 \pm 0.4) \times 10^{-3}$	Thickness: 4.3 layers	N/A	[6]
	CHP	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(3.7 \pm 1.0) \times 10^{-3}$	N/A	N/A	[6]
	ODCB	C_I: 5 mg mL^{-1}; Tip ultrasonication: 30min; CF: 4400 rpm, 5-240 min	0.03	Thickness: 7-10 nm Lateral size: 100-500 nm	N/A	[8]
	1-Propanol	C_I: 0.1 mg mL^{-1};	$\sim 25 \times 10^{-3}$	N/A	I_d/I_g < 0.3	[9]

		Bath ultrasonication: 320 W, 20 min; CF: 4500 rpm, 10 min				
	NFP	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(7.2 \pm 1.0) \times 10^{-3}$	N/A	N/A	[6]
	NVP	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(5.5 \pm 1.5) \times 10^{-3}$	N/A	N/A	[6]
	Bromobenzene	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	5.0×10^{-3}	N/A	N/A	[6]
	Benzonitrile	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(4.6 \pm 0.8) \times 10^{-3}$	N/A	N/A	[6]
	Benzyl benzoate	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(4.7 \pm 1.9) \times 10^{-3}$	N/A	N/A	[6]
	DMPU	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(4.6 \pm 1.3) \times 10^{-3}$	N/A	N/A	[6]
	GBL	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(4.1 \pm 1.1) \times 10^{-3}$	N/A	N/A	[6]
	DMF	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(4.1 \pm 1.4) \times 10^{-3}$	N/A	N/A	[6]

		C_I: 1 wt% Bath ultrasonication:100 W, 6 h; CF: 8000 g, 60 min	$(47 \pm 7) \times 10^{-3}$	Thickness: 1-9 layers Lateral size: 249 ± 9 nm	I_d/I_g = 0.4-0.8	[5]
	DMA	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(3.9 \pm 1.5) \times 10^{-3}$	N/A	N/A	[6]
	DMSO	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(3.7 \pm 1.5) \times 10^{-3}$	N/A	N/A	[6]
	Dibenzyl ether	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(2.5 \pm 0.6) \times 10^{-3}$	N/A	N/A	[6]
	Chloroform	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(3.4 \pm 0.7) \times 10^{-3}$	N/A	N/A	[6]
		C_I: 3.3 mg mL^{-1}; Bath ultrasonication: 16 W, 48 h; CF: 500, 2000, 5000 rpm, 45 min	~ 0.5	N/A	N/A	[7]
	Chlorobenzene	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(2.9 \pm 0.5) \times 10^{-3}$	N/A	N/A	[6]
	N8P	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(2.8 \pm 1.0) \times 10^{-3}$	N/A	N/A	[6]
	N12P	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min;	$(2.1 \pm 1.1) \times 10^{-3}$	N/A	N/A	[6]

		CF: 500 rpm, 90 min				
	1-3 Dioxolane	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(2.8 \pm 1.4) \times 10^{-3}$	N/A	N/A	[6]
	Ethyl acetate	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(2.6 \pm 1.2) \times 10^{-3}$	N/A	N/A	[6]
	Quinoline	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(2.6 \pm 0.6) \times 10^{-3}$	N/A	N/A	[6]
	Benzaldehyde	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(2.5 \pm 1.5) \times 10^{-3}$	N/A	N/A	[6]
	Ethanolamine	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(2.5 \pm 0.4) \times 10^{-3}$	N/A	N/A	[6]
	Diethyl phthalate	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(2.2 \pm 1.9) \times 10^{-3}$	N/A	N/A	[6]
	Pyridine	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(2.0 \pm 1.7) \times 10^{-3}$	N/A	N/A	[6]
	Dimethyl phthalate	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(1.8 \pm 0.4) \times 10^{-3}$	N/A	N/A	[6]
	Formamide	C_I: 0.1 mg mL^{-1};	1.7×10^{-3}	N/A	N/A	[6]

		Bath ultrasonication: 30 min; CF: 500 rpm, 90 min				
	Ethanol	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(1.6 \pm 0.7) \times 10^{-3}$	N/A	N/A	[6]
	Vinyl acetate	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(1.5 \pm 0.7) \times 10^{-3}$	N/A	N/A	[6]
	Water	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(1.1 \pm 0.4) \times 10^{-3}$	N/A	N/A	[6]
	EG	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(1.0 \pm 0.8) \times 10^{-3}$	N/A	N/A	[6]
	Toluene	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(0.8 \pm 0.4) \times 10^{-3}$	N/A	N/A	[6]
	Heptane	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(0.3 \pm 0.4) \times 10^{-3}$	N/A	N/A	[6]
	Hexane	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(0.2 \pm 0.1) \times 10^{-3}$	N/A	N/A	[6]
	Pentane	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(0.16 \pm 0.05) \times 10^{-3}$	N/A	N/A	[6]

	o-DCB	C_I: 1 wt% Bath ultrasonication: 100 W, 6 h; CF: 8000 g, 60 min	$(98 \pm 9) \times 10^{-3}$	Thickness: 1-5 layers Lateral size: 192 ± 21 nm	I_d/I_g = 0.4-0.8	[5]
	Alcohol/water	C_I: 2 mg mL^{-1}; Tip ultrasonication: 3 h; CF: 14500 rpm, 5 min, then 14500 rpm, 15 min	N/A	Thickness: 1-6 nm Lateral size: 1-100 μm	N/A	[10]
	TCB	C_I: 1 wt% Bath ultrasonication: 100W, 6 h; CF: 8000 g, 60 min	$(64 \pm 7) \times 10^{-3}$	Thickness: 2-7 layers Lateral size: 249 ± 20 nm	I_d/I_g = 0.4-0.8	[5]
	CPO	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(8.5 \pm 1.2) \times 10^{-3}$	N/A	N/A	[6]
	Pentane	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(0.16 \pm 0.05) \times 10^{-3}$	N/A	N/A	[6]
	DMEU	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(5.4 \pm 1.3) \times 10^{-3}$	N/A	N/A	[6]
	NEP	C_I: 0.1 mg mL^{-1}; Bath ultrasonication: 30 min; CF: 500 rpm, 90 min	$(4.0 \pm 0.7) \times 10^{-3}$	N/A	N/A	[6]
	C_6F_6	C_I: 5 mg mL^{-1}; Bath ultrasonication: 135 W, 1 h; CF: 4400 rpm, 30 min	0.08	Thickness: 0.5-1 nm	N/A	[11]
	$C_6F_5CF_3$	C_I: 5 mg mL^{-1},	0.05	Thickness: 0.5-1 nm	N/A	[11]

		Bath ultrasonication: 135 W, 1 h; CF: 4400 rpm, 30 min				
	C_6F_5CN	C_I: 5 mg mL^{-1}; Bath ultrasonication: 135 W, 1 h; CF: 4400 rpm, 30 min	0.1	Thickness: 0.5-1 nm	N/A	[11]
	C_5F_5N	C_I: 5 mg mL^{-1}; Bath ultrasonication: 135 W, 1 h; CF: 4400 rpm, 30 min	0.05	Thickness: 0.5-1 nm	N/A	[11]
	Pyridine	C_I: 5 mg mL^{-1}; Bath ultrasonication: 135 W, 1 h; CF: 4400 rpm, 30 min	0.3	N/A	N/A	[11]
	MSA	C_I: 2 mg mL^{-1}; Bath ultrasonication: 2 h; CF: 3000 rpm, 90 min	0.2	Lateral size: hundred nanometres-micrometres Thickness: 1-3 nm	N/A	[12]
	Acetone/tetrahydrofuran/water	C_I: 20 mg mL^{-1}; Tip ultrasonication: 600 W, 1 h; CF: 1500 rpm, 30 min	> 0.26	Thickness: 1.5-2.8 nm	N/A	[13]
Black phosphorus	NMP	C_I: 5 mg mL^{-1}; Bath ultrasonication: 820 W, 37 kHz, 24 h; CF: 1500 rpm, 45 min	N/A	Thickness: 3.5-5 nm	N/A	[14]
		Tip ultrasonication: ~30 W, 1 h; CF: 500-15000 rpm, 10 min	~ 0.4	Thickness: 16-128 nm	N/A	[15]
		C_I: 5 mg mL^{-1}; Bath ultrasonication: 400 W, 48 h; CF: 1000-4000 rpm, 60 min	N/A	N/A	N/A	[16]

		C_I: 1 mg mL^{-1}; Tip ultrasonication: 110 W, 40 kHz, 8 h; CF: 3000 rpm, 10 min, then 5000 rpm 15 min, further 10000 rpm 15 min	N/A	Thickness: ~ 3 nm Lateral size: ~ 10 nm	N/A	[17]
	CHP	C_I: 1 mg mL^{-1}; Bath ultrasonication: 6 h; CF: 560 g, 180 min	~ 0.12×10^{-3}	Thickness: ~15 layers Lateral size: 0.1-1.5 μm	N/A	[18]
		C_I: 2 mg mL^{-1}; Tip ultrasonication: 750 W, 60% amplitude, 5 h; CF: 1000 rpm, 30 min	~ 1	Thickness: n ⩽ 10 Lateral size: ~ 100 nm-3 μm	N/A	[19]
	Acetone	C_I: 5 mg mL^{-1}; Bath ultrasonication: 400 W, 48 h, 28 ℃; CF: 1000-4000 rpm, 60 min	N/A	N/A	N/A	[16]
		Initial concentration: 1 mg mL$^{-1;}$ Ultrasonication: 300 W, 10 h; CF: 2000 rpm, 60 min	N/A	Thickness: < 100 nm	N/A	[20]
	NMP/NaOH	C_I: 0.5 mg mL^{-1}; Ultrasonication: 40 kHz, 4 h; CF: 3000 rpm, 10 min, 12000 rpm, 20 min 18000 rpm, 20 min	N/A	Thickness: 5.3 ±2.0 nm Lateral size: 670 nm (CF: 12000 rpm) Thicknesses: 2.8 ±1.5 nm Lateral size: 210 nm (CF: 18000 rpm)	N/A	[21]
	DMF	C_I: 0.02 mg mL^{-1}; Tip ultrasonication: 750 W, 60% amplitude, 5 h;	~ 10×10^{-3}	Lateral size: ~190 nm Thickness: < 5 nm (> 20%)	N/A	[22]

		CF: 2000 rpm, 30 min				
	DMSO	C_I: 0.02 mg mL^{-1}; Tip ultrasonication: 130 W, 15 h; CF: 2000 rpm, 30 min	~ 10×10^{-3}	Lateral size: ~ 532 nm Thickness: 15-20 nm	N/A	[22]
	Ethanol	C_I: 2.5 mg mL^{-1}; Bath ultrasonication: 400 W, 48 h, CF: 1000-4000 rpm, 60 min	N/A	Thickness: 2-7nm Lateral size: 50-200 nm	N/A	[16]
	IPA	C_I: 5 mg mL^{-1}; Bath ultrasonication: 400 W, 48 h, 28 ℃; CF: 1000-4000 rpm, 60 min	N/A	Thickness: 2-7nm Lateral size: 5-200 nm	N/A	[16]
MoS_2	NMP	C_I: 2 mg mL^{-1}; Tip ultrasonication: 8 h; CF: 3000 rpm, 15 min, then 5000 rpm followed by 10000 rpm, 30 min	N/A	Thickness: ~ 4-5 nm	N/A	[23]
		Grounding for 30 min; C_I: 50 mg mL^{-1}; Tip ultrasonication: 125 W, 90 min; CF: 4000 rpm, 60 min, then 4000 rpm, 30 min	8.8 ×10^{-3}	Thickness: 1.4-3.5 nm Lateral size: ~ 20-200 nm	N/A	[24]
		C_I: 7.5 mg mL^{-1}; Tip ultrasonication: 100-400 W, 80 min; CF: 1500 rpm, 45 min, then 2000 rpm, 45 min	N/A	Thickness: 3-7 nm, 1-5 nm and 2-10 nm (100, 250 and 400 W)	N/A	[25]
		C_I: 3 mg mL^{-1}; Tip ultrasonication: 750 W, 60% amplitude, 60 min;	~ 40	N/A	N/A	[26]

		CF: 1500 rpm, 45 min				
	1-Vinyl-2 pyrrolidone	C_I: 5 mg mL^{-1}; Tip ultrasonication: 40 kHz, 48 h; CF: 4000 rpm, 30min	N/A	Thickness: 5-10 nm Lateral size: 400-500 nm	N/A	[27]
	Hexane	C_I: 50 mg mL^{-1}; Tip ultrasonication: 125 W, 90 min; CF: 4000 rpm, 60 min, then 4000 rpm, 30 min	6.9 ×10^{-3}	Thickness: 5.5-11 nm Lateral size: 20-120 nm	N/A	[24]
	Chloroform /acetonitrile	C_I: 3 mg mL^{-1}; Tip ultrasonication: 450 W, 1 h; CF: 3000 rpm, 30 min	0.4	Thickness: ~ 8-2.5 nm	N/A	[28]
	H_2O_2/NMP	C_I: 1 mg mL^{-1}; Tip ultrasonication: 600 W, 1 h; CF: 5000 rpm, 30 min	Yield: 60%	Lateral size: ~ 3-5 μm Thickness: 2.86 nm	N/A	[29]
	IPA	C_I: 0.2 mg mL^{-1}; Ultrasonication: 500 W, 20 kHz, 6 h; CF: 4000 rpm, 30 min	N/A	Thickness: 10-30 nm Lateral size: 60-250 nm	N/A	[30]
		C_I: 20 mg mL^{-1}; Ultrasonication: 60% amplitude, 5 h; CF: 1500 rpm, 90 min	N/A	Lateral size: 260 nm	N/A	[31]
	Cyclohexane	Grinding for 30 min; C_I: 50 mg mL^{-1}; Tip ultrasonication: 125 W, 90 min; CF: 4000 rpm, 60 min, then 4000 rpm, 30 min	5.9 ×10^{-3}	Thickness: 1.4-3.5 nm Lateral size: ~ 20-200 nm	N/A	[24]
	Water	C_I: 50 mg mL^{-1};	0.14 ±0.1	Lateral size: 242 nm	N/A	[32]

		Bath ultrasonication: 50 min; CF: 1500 rpm, 45 min				
	Water/ethanol/CO_2	C_I: 50 mg mL^{-1}; Bath ultrasonication: 50 min; CF: 1500 rpm, 45 min	N/A	N/A	N/A	[32]
	Alcohol/water	C_I: 2 mg mL^{-1}; Tip ultrasonication: 3 h; CF: 14500 rpm, 5 min, then 14500 rpm, 15 min	N/A	Thickness: 1-6 nm Lateral size: 1-100 μm	N/A	[10]
	Ethanol/water	Grinding with NMP for 0.5-3 h; C_I: 40 mg mL^{-1}; Ultrasonication: 3-120 h; CF: 6000 rpm, 30 min	26.7 ± 0.7	Thickness: 1.2-8.5 nm Lateral size: 20-60 nm	N/A	[33]
		C_I: 3 mg mL^{-1}; Ultrasonication: 8 h; CF: 3000 rpm, 20 min	0.018 ± 0.003	Thickness: 2-4 nm Lateral size: > 100 nm	N/A	[34]
	IPA/water	C_I: 30 mg mL^{-1}; Bath ultrasonication: 40 kHz, 26 W L^{-1}; CF: 1500 rpm, 20 min	0.71 ± 0.02	N/A	N/A	[35]
h-BN	IPA	C_I: 3 mg mL^{-1}; Ultrasonication: 48 h; CF: 1500 rpm, 45 min	N/A	N/A	N/A	[36]
	Ethylene glycol	C_I: 2 mg mL^{-1}; Tip ultrasonication: 8 h; CF: 3000 rpm, 15 min, then 5000 rpm followed by 10000 rpm, 30 min	N/A	Thickness: ≤ 100 nm	N/A	[23]

	Ethanol/water	C_I: 3 mg mL^{-1}; Ultrasonication: 8 h; CF: 3000 rpm, 20 min	0.075 ± 0.003	Lateral size: 100 nm Thickness: 3-4 nm	N/A	[34]
	MSA	C_I: 2 mg mL^{-1}; Ultrasonication: 8 h; CF: 4000 rpm, 90 min	0.2 - 0.3	Thickness: < 3 nm	N/A	[37]
WS_2	IPA/water	C_I: 30 mg mL^{-1}; Bath ultrasonication: 40 kHz, 26 W L^{-1}; CF: 1500 rpm, 20 min	0.78 ± 0.07	N/A	N/A	[35]
	Ethanol/water	C_I: 3 mg mL^{-1}; Ultrasonication: 8 h; CF: 3000 rpm, 20 min	0.032 ± 0.003	Thickness: 3 nm Lateral size: > 100 nm	N/A	[34]

Table S2 Comparison of 2D material dispersions in ionic liquids

2D materials	Ionic liquid	Exfoliation condition	Concentration (mg mL^{-1})	Dimension	Ref.
Graphene	[Bmim][Tf_2N]	C_I: 2 mg mL^{-1}; Tip ultrasonication: 750 W, 80% amplitude, 60 min; CF: 10000 rpm, 20 min	0.95	Thickness: < 5 layers	[38]
	[$BnzC_1im$][NTf_2]	C_I: 10 mg mL^{-1}; Tip ultrasonication: 10 W, 1 h; CF: 5000 rpm, 6 h	0.081	N/A	[39]
	[$(Bnz)_2im$][NTf_2]	C_I: 10 mg mL^{-1}; Tip ultrasonication: 10 W, 1 h; CF: 5000 rpm, 6 h	5.8	N/A	[39]
	HMIH	Grinding for 10 min; C_I: 2 mg mL^{-1}; Bath ultrasonication: 550 W, 24 h; CF: 4000 rpm, 30 min	5.33	Lateral size: 3-4 μm; Thickness: 2 nm	[40]
Black phosphorus	[BMIM][BF_4]	Grinding for 20 min; C_I: 3 mg mL^{-1}; Ice-bath ultrasonication: 100 W, 24 h; CF: 4000 rpm, 45 min	0.29	N/A	[41]
	[BMIM] [TfO]	Grinding for 20 min; C_I: 3 mg mL^{-1}; Ice-bath ultrasonication: 100 W, 24 h; CF: 4000 rpm, 45 min	0.22	N/A	[41]
	[BMIM] [Tf_2N]	Grinding for 20 min;	0.17	N/A	[41]

		C_I: 3 mg mL^{-1}; Ice-bath ultrasonication: 100 W, 24 h; CF: 4000 rpm, 45 min			
	[EMIM] [Tf_2N]	Grinding for 20 min; C_I: 3 mg mL^{-1}; Ice-bath ultrasonication: 100 W, 24 h; CF: 4000 rpm, 45 min	0.1	N/A	[41]
	[EMIM][BF_4]	Grinding for 20 min; C_I: 3 mg mL^{-1}; Ice-bath ultrasonication: 100 W, 24 h; CF: 4000 rpm, 45 min	0.75	N/A	[41]
	[HMIM]) [BF_4]	Grinding for 20 min; C_I: 3 mg mL^{-1}; Ice-bath ultrasonication: 100 W, 24 h; CF: 4000 rpm, 45 min	0.73	N/A	[41]
	[OMIM] [BF_4]	Grinding for 20 min; C_I: 3 mg mL^{-1}; Ice-bath ultrasonication: 100 W, 24 h; CF: 4000 rpm, 45 min	0.14	N/A	[41]
	[HOEMIM] [TfO]	Grinding for 20 min; C_I: 3 mg mL^{-1}; Ice-bath ultrasonication: 100 W, 24 h; CF: 4000 rpm, 45 min	0.95	Lateral size: 8-8.9 nm	[41]
	[HOEMIM] [BF_4]	Grinding for 20 min; C_I: 3 mg mL^{-1}; Ice-bath ultrasonication: 100 W, 24 h;	0.91	N/A	[41]

		CF: 4000 rpm, 45 min			
h-BN	[emim][Tf_2N]	C_I: 5 mg mL^{-1}; Ultrasonication: 8 h; CF: 3000 rpm (1220 g), 20 min	0.17	N/A	[42]
	[bmim][Tf_2N]	C_I: 5 mg mL^{-1}; Ultrasonication: 8 h; CF: 3000 rpm (1220 g), 20 min	0.51	N/A	[42]
	[hmim][Tf_2N]	C_I: 5 mg mL^{-1}; Ultrasonication: 8 h; CF: 3000 rpm (1220 g), 20 min	0.30	N/A	[42]
	[bpy][Tf_2N]	C_I: 5 mg mL^{-1}; Ultrasonication: 8 h; CF: 3000 rpm (1220 g), 20 min	0.34	N/A	[42]
	[emim][TfO]	C_I: 5 mg mL^{-1}; Ultrasonication: 8 h; CF: 3000 rpm (1220 g), 20 min	0.10	N/A	[42]
	[bmim][TfO]	C_I: 5 mg mL^{-1}; Ultrasonication: 8 h; CF: 3000 rpm (1220 g), 20 min	0.13	N/A	[42]
	[emim][BF_4]	C_I: 5 mg mL^{-1}; Ultrasonication: 8h; CF: 3000 rpm (1220 g), 20 min.	0.08	N/A	[42]
	[bmim][BF_4]	C_I: 5 mg mL^{-1}; Ultrasonication: 8 h; CF: 3000 rpm (1220 g), 20 min	0.11	N/A	[42]

	[bmim][PF_6]	C_I: 5 mg mL^{-1}; Ultrasonication: 8 h; CF: 3000 rpm (1220 g), 20 min	1.86	Thickness: 6.3 layers Lateral size: 1.34 μm	[42]
	[hmim][PF_6]	C_I: 5 mg mL^{-1}; Ultrasonication: 8 h; CF: 3000 rpm (1220 g), 20 min	0.67	N/A	[42]

Table S3 Comparison of surfactant-stabilized 2D material dispersions

2D materials	**Surfactant**	**Solvent**	**Exfoliation condition**	**Concentration (mg mL^{-1})**	**Dimension**	**Raman**	**Ref.**
Graphene	SC	Water	C_i: 0.078 mg mL^{-1}; Tip ultrasonication: 51-52 W, 1 h; CF: 1500 rpm, 90 min	0.09-0.25	Thickness: ≤ 1.2 nm (80%)	N/A	[43]
		Water	C_i: 5 mg mL^{-1}; Bath ultrasonication: 16 W, 24 h; CF: 1500 rpm, 90 min	~ 0.3	Thickness: ~ 4 layers Lateral size: 400 nm-1 μm	N/A	[44]
		Water	C_i: 0.75 mg mL^{-1}; Bath ultrasonication: 140 + 140 min, CF: 5000 rpm, 90 min	0.04	Lateral size: 100 nm-3 μm	N/A	[45]
		Water	C_i: 100-700 mg mL^{-1}; Bath ultrasonication: 120 W, 3 h; CF: 10000 rpm, 15 min	0.041	N/A	N/A	[46]
	Pluronic P-123	Water	C_i: 100 mg mL^{-1}; Bath ultrasonication: 40 kHz, 2-5 h; CF: 5000 g, 5 min	~ 1	Lateral size: 100 nm Thickness: 1.4-3 nm	N/A	[47]
	NDI-1	Water	C_i: 100 mg mL^{-1}; Tip ultrasonication: 20 kHz, 1 h; CF: 4000 rpm, then 7000 rpm	1.2-5.0	Thickness: 1.5-2.0 nm	N/A	[48]
	SDBS	Water	C_i: 0.1-14 mg mL^{-1}; Ultrasonication: 30 min;	0.002-0.05	Thickness: < 5 layers .	N/A	[49]

			CF: 500 rpm, 90 min				
		Water	C_I: 86 mg mL^{-1}; Tip ultrasonication: 7 W, 1 h; CF: 5000 rpm, 12 h	0.2	Thickness: 4-6 nm	N/A	[50]
	STC	Water	C_I: 200 mg mL^{-1}; Tip ultrasonication: 100 W, 20 kHz, 24 h; CF: 5000 rpm, 90 min	7.1	Thickness: < 5 layers (82%)	N/A	[51]
	SDC	Water	C_I: 100-700 mg mL^{-1}; Bath ultrasonication: 120 W, 3 h; Then the solution was left for 24 h; CF: 10000 rpm, 15 min	2.28	Lateral size: 65-100 nm	N/A	[46]
	5TN-PEG	Ethanol	C_I: 0.52 mg mL^{-1}; Bath ultrasonication: 5 h; CF: 2000 rpm, 90 min	N/A	Lateral size: > 1 μm	N/A	[52]
	SDS	MeOH	C_I: 100 mg mL^{-1}; Ultrasonication: 665 W, 40 kHz, 1 h; CF: 500 rpm, 15 min	N/A	N/A	N/A	[53]
		EtOH	C_I: 100 mg mL^{-1}; Ultrasonication: 665 W, 40 kHz, 1 h; CF: 500 rpm, 15 min	2.1	Thickness: 1-4 layers Lateral size: 30-90 nm	N/A	[53]
		Water	Bath ultrasonication: 60 W; CF: 1500 g, 15 min	0.06	N/A	N/A	[54]

		Water	C_I: 10 mg mL^{-1}; Ball milling for 12 h; Bath ultrasonication: 80 W, 2 h; CF: 5000 rpm, 20 min	0.9	N/A	N/A	[55]
	F127	Water	Bath ultrasonication: 60 W, CF: 1500 g, 15 min	0.078	N/A	N/A	[54]
	F108	Water	Bath ultrasonication: 60 W; CF: 1500 g, 15 min	0.11	N/A	N/A	[54]
	CTAB	Water	Bath ultrasonication: 60 W; CF: 1500 g, 15 min	0.05	N/A	N/A	[54]
		Acetic acid	C_I: 100 mg mL^{-1}; Ultrasonication: 4 h; CF: 20000 rpm, 45 min	N/A	Thickness: 1.18 nm Lateral size: 0.5-0.7 μm	N/A	[56]
	TTAB	Water	Bath ultrasonication: 60 W; CF: 1500 g, 15 min	0.055	N/A	N/A	[54]
	1H,1H,11H-eycosofluor-1-decanole polyglycidyl ether	Water	C_I: 6 mg mL^{-1}; Tip ultrasonication: 200 W, 10 min-6 h	6	Thickness: 1–4 nm	N/A	[57]
	Melissic acid	NMP	C_I: 1 wt% Bath ultrasonication: 100W, 6 h; CF: 8000 g, 60 min	0.24	N/A	I_d/I_g = 0.6-1.5	
	Lignoceric acid	*o*-DCB	C_I: 1 wt% Bath ultrasonication:100W, 6 h; CF: 8000 g, 60 min	N/A	N/A	I_d/I_g = 0.3-0.5	

		TCB	C_I: 1 wt% Bath ultrasonication:100W, 6 h; CF: 8000 g, 60 min	N/A	N/A	I_d/I_g = 0.8-1.2	
	Melissic acid	DMF	C_I: 1 wt% Bath ultrasonication:100W, 6 h; CF: 8000 g, 60 min	N/A	N/A	I_d/I_g = 0.4-0.8	
	RNA	Water	Ultrasonication: 4 h; CF: 6000 rpm, 1 h	N/A	N/A	N/A	[58]
MoS_2	SC	Water	C_I: 5 mg mL^{-1}; Bath ultrasonication: 250 W, 20 h; CF: 3000 rpm, 30 min, then 12000 rpm, 30 min	N/A	Lateral size: 30-210 nm	N/A	[59]
		Water	C_I: 30 mg mL^{-1}; Ultrasonication: 40 kHz; CF: 1500 rpm, 20 min	0.38 ± 0.06	N/A	N/A	[35]
		Water	C_I: 5 mg mL^{-1}; Ultrasonication: 30 min; CF: 1500 rpm, 90 min	0.25	N/A	N/A	[60]
	Tween 80	Water	C_I: 30 mg mL^{-1}; Bath ultrasonication: 40 kHz; CF: 1500 rpm, 20 min	1.5 ± 0.3	N/A	N/A	[35]
	Tween 85	Water	C_I: 30 mg mL^{-1}; Bath ultrasonication: 40 kHz; CF: 1500 rpm, 20 min	0.25 ± 0.06	N/A	N/A	[35]
	Triton X-100	Water	C_I: 30 mg mL^{-1}; Bath ultrasonication: 40 kHz;	0.6 ± 0.1	N/A	N/A	[35]

			CF: 1500 rpm, 20 min				
	SDS	Water	C_I: 11 mg mL^{-1}; Bath ultrasonication: 100 W, 8 h; CF: 5000 rpm, 30 min	N/A	Thickness: 1-1.5 nm Lateral size: 100 nm	N/A	[61]
		Water	C_I: 10 mg mL^{-1}; Ball milling for 12 h; Bath ultrasonication: 80 W, 2 h; CF: 5000 rpm, 20 min	0.8	Lateral size: 50-700 nm Thickness: 1.2-8 nm	N/A	[55]
	CTAB	Water	C_I: 11 mg mL^{-1}; Bath ultrasonication: 100 W, 8 h; CF: 5000 rpm, 30 min	N/A	Thickness: 1-1.5 nm Lateral size: 100 nm	N/A	[61]
	Pluronic P-123	Water	C_I: 30 mg mL^{-1}; Ultrasonication: 40 kHz; CF: 1500 rpm, 20 min	12 ± 2	N/A	N/A	[35]
	Alkyl-trichlorosilane	1,2-dichlorobenzene (DCB)	C_I: 15 mg mL^{-1}, Ultrasonication: 60% amplitude, 6 h; CF: 5500 rpm, 30 min	0.5	Lateral size: 100 nm-0.5 μm	N/A	[62]
	Gum arabic	Water	C_I: 30 mg mL^{-1}; Bath ultrasonication: 40 kHz; CF: 1500 rpm, 20 min	0.4 ± 0.1	N/A	N/A	[35]
	DBDM	Water	C_I: 30 mg mL^{-1}; Ultrasonication: 40 kHz; CF: 1500 rpm, 20 min	1.2 ± 0.4	N/A	N/A	[35]
$MoSe_2$	SC	Water	C_I: 20 mg mL^{-1}; Tip ultrasonication: 200 W, 24	N/A	Lateral size: 50-400 nm	N/A	[63]

			kHz, 6 h; CF: 1500 rpm, 90 min				
WS_2	SC	Water	C_I: 20 mg mL^{-1}; Tip ultrasonication: 60% amplitude, 1 h, 5000 rpm, 1.5 h, then 60% amplitude, 5 h; Cascade Centrifugation	N/A	Thickness: single layer (80%)	N/A	[64]
		Water	C_I: 30 mg mL^{-1}; Ultrasonication: 40 kHz; CF: 1500 rpm, 20 min	0.77 ± 0.08	N/A	N/A	[35]
	Tween 85	Water	C_I: 30 mg mL^{-1}; Ultrasonication: 40 kHz; CF: 1500 rpm, 20 min	0.04 ± 0.02	N/A	N/A	[35]
	Tween 80	Water	C_I: 30 mg mL^{-1}; Ultrasonication: 40 kHz; CF: 1500 rpm, 20 min	0.8 ± 0.5	N/A	N/A	[35]
	Triton X-100	Water	C_I: 30 mg mL^{-1}; Bath ultrasonication: 40 kHz; CF: 1500 rpm, 20 min	1.3 ± 0.2	N/A	N/A	[35]
	DBDM	Water	C_I: 30 mg mL^{-1}; Bath ultrasonication: 40 kHz; CF: 1500 rpm, 20 min	2.9 ± 0.8	N/A	N/A	[35]
	Gum Arabic	Water	C_I: 30 mg mL^{-1}; Ultrasonication: 40 kHz; CF: 1500 rpm, 20 min	2.1 ± 0.6	N/A	N/A	[35]
	Pluronic	Water	C_I: 30 mg mL^{-1};	2.8 ± 0.7	N/A	N/A	[35]

	P-123		Bath ultrasonication: 40 kHz; CF: 1500 rpm, 20 min				
h-BN	DBDM	Water	C_I: 30 mg mL^{-1}; Bath ultrasonication: 40 kHz; CF: 1500 rpm, 20 min	0.046	N/A	N/A	[35]
	SC	Water	C_I: 30 mg mL^{-1}; Bath ultrasonication: 40 kHz; CF: 1500 rpm, 20 min	0.08 ± 0.02	N/A	N/A	[35]
	Tween 80	Water	C_I: 30 mg mL^{-1}; Ultrasonication: 40 kHz; CF: 1500 rpm, 20 min	0.08 ± 0.01	N/A	N/A	[35]
	Tween 85	Water	C_I: 30 mg mL^{-1}; Bath ultrasonication: 40 kHz; CF: 1500 rpm, 20 min	0.05 ± 0.01	N/A	N/A	[35]
	Triton X-100	Water	C_I: 30 mg mL^{-1}; Bath ultrasonication: 40 kHz; CF: 1500 rpm, 20 min	0.05 ± 0.02	N/A	N/A	[35]
	SDS	Water	C_I: 10 mg mL^{-1}; Ball milling for 12 h; Bath ultrasonication: 80 W, 2 h; CF: 5000 rpm, 20 min	1.2	Lateral size: 10-500 nm Thickness: 1.28 nm	N/A	[55]
	Gum arabic	Water	C_I: 30 mg mL^{-1}; Ultrasonication: 40 kHz; CF: 1500 rpm, 20 min	0.056 ± 0.005	N/A	N/A	[35]
	Pluronic P-123	Water	C_I: 30 mg mL^{-1}; Ultrasonication: 40 kHz;	0.08 ± 0.03	N/A	N/A	[35]

			CF: 1500 rpm, 20 min				

Table S4 Comparison of 2D material dispersions in polymer solutions

2D materials	**Polymer**	**Solvent**	**Exfoliation condition**	**Concentration (mg mL^{-1})**	**Dimension**	**Ref.**
Graphene	PVP	Water	C_I: 5 mg mL^{-1}; Bath ultrasonication: 135 W, 9 h; CF: 1500 rpm, 30 min	0.15-0.2	N/A	[65]
		Water	C_I: 40 mg mL^{-1}; Bath ultrasonication: 10 W, 1 h; CF: 5000 rpm, 4 h	0.42	N/A	[66]
		Water	C_I: 6 mg mL^{-1}; Bath ultrasonication: 100 h; CF: 1000 rpm, 4 h	0.9	Thickness: 2.3 nm Lateral size: 1.2 nm-1.3 μm	[67]
		VP	C_I: 40 mg mL^{-1}; Bath ultrasonication: 10 W, 1 h; CF: 5000 rpm, 4 h	0.72	N/A	[66]
		Ethanol	C_I: 40 mg mL^{-1}; Bath ultrasonication: 10 W, 1 h; CF: 5000 rpm, 4 h	0.40	Thickness: 2-4 layers	[66]
		Methanol	C_I: 40 mg mL^{-1}; Bath ultrasonication: 10 W, 1 h; CF: 5000 rpm, 4 h	0.40	N/A	[66]

		DMF	C_I: 40 mg mL^{-1}; Bath ultrasonication: 10 W, 1 h; CF: 5000 rpm, 4 h	0.53	N/A	[66]
		DMSO	C_I: 40 mg mL^{-1}; Bath ultrasonication: 10 W, 1 h; CF: 5000 rpm, 4 h	0.45	N/A	[66]
		NMP	C_I: 40 mg mL^{-1}; Bath ultrasonication: 10 W, 1 h; CF: 5000 rpm, 4 h	0.53	N/A	[66]
	Py-HA	Water	C_I: 2 mg mL^{-1}; Tip ultrasonication: 150 W, 2 h; CF: 5180 rpm, 45 min	N/A	Thickness: 10 nm	[68]
	CNC	Sulfuric acid	C_I: 0.2-4 mg mL^{-1}; Ice-bath tip ultrasonication: 70% amplitude; CF: 4500 rpm, 2-3 h	~ 1	Thickness: 0.9 ± 0.2 nm	[69]
	P20	Ethanol	Bath ultrasonication: 35 kHz, 24 h; CF: 500 rpm, 90min.	~ 4	Thickness: 5 layers Lateral size: 500-1.5 μm	[70]
	Pluronic	Water	C_I: 75 mg mL^{-1}; Tip ultrasonication: 16-18 W, 30 min; CF: 15000 rpm, 5 min	~ 0.07	Thickness: 1-4 nm Lateral size: ~ 50-several hundred nm	[71]
	Alkali lignin	Water	C_I: 40 mg mL^{-1}; Tip ultrasonication: 450 W, 20 kHz, 2-20 h; CF: 600 rpm, 90 min	~ 0.65	Lateral size: < 2 nm	[72]

	Poly(1-vinylimidazole)	Water	C_I: 3-75 mg mL^{-1}; Bath ultrasonication: 40 W, 37 kHz, 1.5 h; CF: 2000 rpm, 90 min	~ 0.018	N/A	[73]
	Poly(1-vinyl-3-butylimidazolium chloride-co-1-vinylimidazole) (35/65)	Water	C_I: 3-75 mg mL^{-1}; Bath ultrasonication: 40 W, 37 kHz, 1.5 h; CF: 2000 rpm, 90 min	~ 0.078	N/A	[73]
	Poly(1-vinylimidazole-co-PyMMA) (97/3)	Water	C_I: 3-75 mg mL^{-1}; Bath ultrasonication: 40 W, 37 kHz, 1.5 h; CF: 2000 rpm, 90 min	~ 0.25	N/A	[73]
	Poly(1-vinyl-3-butylimidazolium chloride-co-1-vinylimidazole-coPyMMA)(47/50/3)	Water	C_I: 3-75 mg mL^{-1}; Bath ultrasonication: 40 W, 37 kHz, 1.5 h; CF: 2000 rpm, 90 min	3.25	Thickness: 1.1-2.9 nm	[73]
	HBPE	THF	C_I: 2 mg mL^{-1}; Bath ultrasonication: 70 W, 48 h; CF: 2000 rpm, 45 min	0.14-0.3	Thickness: ~ 2.2 nm	[74]
	PVA	water	Initial concentration: 0.18 mg mL^{-1}; Bath ultrasonication: 60% amplitude, 30 min; CF: 8000 g, 10 min	N/A	Thickness: ~ 5 layers	[75]

	Ph-PVA	water	C_I: 0.18 mg mL^{-1}; Bath ultrasonication: 60% amplitude, 30 min; CF: 8000 g, 10 min	N/A	Thickness: ~ 2 layers	[75]
	Py-PVA	water	C_I: 0.18 mg mL^{-1}; Bath ultrasonication: 60% amplitude, 30 min; CF: 8000 g, 10 min	N/A	Thickness: ~ 3-4 layers	[75]
	DT	water	C_I: 0.18 mg mL^{-1}; Bath ultrasonication: 60% amplitude, 30 min; CF: 8000 g, 10 min	N/A	Thickness: ~ 5 layers	[75]
	Ph-DT	water	C_I: 0.18 mg mL^{-1}; Bath ultrasonication: 60% amplitude, 30 min; CF: 8000 g, 10 min	N/A	Thickness: ~ 5 layers	[75]
	Py-DT	water	C_I: 0.18 mg mL^{-1}; Bath ultrasonication: 60% amplitude, 30 min; CF: 8000 g, 10 min	N/A	Thickness: ~ 3-5 layers	[75]
	2,3,6,7,10,11-hexahydroxytriphenylene	water	C_I: 2.5 mg mL^{-1}; Bath ultrasonication: 72 h; CF: 3000 rpm, 1 h	0.19	Lateral size: ~ 150 nm	[76]
	2,3,6,7,10,11-acetyl oxy triphenylene	water	C_I:2.5 mg mL^{-1}; Bath ultrasonication: 72 h; CF: 3000 rpm, 1 h	0.096	N/A	[76]

	2,3,6,7,10,11-methoxy triphenylene	water	C_I: 2.5 mg mL^{-1}; Bath ultrasonication: 72 h; CF: 3000 rpm, 1 h	0.027	N/A	[76]
MoS_2	Alkali lignin	Water	C_I: 5 mg mL^{-1}; Bath ultrasonication: 200 W, 5-80 h; CF: 1500 rpm, 15 min	1.75 ± 0.08	Lateral size: 100-500 nm	[77]
	Py-HA	Water	C_I: 3 mg mL^{-1}; Tip ultrasonication: 150 W, 2 h; CF: 5180 rpm (1700 g), 45 min	N/A	Thickness: 15-20 nm	[68]
	P3HT	Chloroform	C_I: 0-10 mg mL^{-1}; Bath ultrasonication: 150 W, 20 min	N/A	N/A	[78]
	PVA	Water	C_I: 2 mg mL^{-1}; Ultrasonication: 40 kHz; CF: 1500 rpm, 20 min	0.22 ± 0.01	N/A	[35]
WS_2	PVA	Water	C_I: 10 mg mL^{-1}; Ultrasonication: 40 kHz; CF: 1500 rpm, 20 min	0.6 ± 0.1	N/A	[35]
		Water	C_I: 30 mg mL^{-1}; Ultrasonication: 1 h, 35% amplitude; CF: 500 rpm (24.4 g), 12 h	2	Thickness: ~ 3 layers Lateral size: 60 nm	[79]
h-BN	PVA	Water	C_I: 1 mg mL^{-1}; Ultrasonication: 40 kHz; CF: 1500 rpm, 20 min	0.11 ± 0.05	N/A	[35]

		Water	C_I: 20 mg mL^{-1}; Tip ultrasonication: 150 W, 12 h; CF: 1000 rpm, 45 min	N/A	Thickness: 3-7000 nm	[80]
	Py-HA	Water	C_I: 3 mg mL^{-1}; Tip ultrasonication: 150 W, 2 h; CF: 5180 rpm (1700 g), 45 min	N/A	Thickness: 10 nm	[68]

Table S5 Comparison of 2D material dispersions stabilized by biomolecules, polycyclic aromatic molecules, and other additives

2D materials	**Stabilizer**	**Solvent**	**Exfoliation condition**	**Concentration (mg mL^{-1})**	**Dimension**	**Raman**	**Ref.**
Graphene	Graphene quantum dots	Water	C_I: 2.5 mg mL^{-1}; Bath ultrasonication: 2 h	0.4	Lateral size: 0.5-10 μm Thickness: 1-3 nm	N/A	[81]
	Carbon quantum dots	Water	C_I: 0.48 mg mL^{-1}; Ice-water bath ultrasonication: 800 W, 10-60 min; CF: 500 rpm, 30 min, then 11000 rpm, 10 min	0.4	Thickness: < 5 layers	I_d/I_g = 0.53 I_{2d}/I_g = 0.55	[82]
	p-Phosphonic acid calix[8]arene	Water	C_I: 2 mg mL^{-1}; Ultrasonication: 90 min; CF: 1500 g, 30 min	~ 4	N/A	N/A	[83]
	Naphthalene	Benzylamine	C_I: 5 mg mL^{-1};	0.15	N/A	N/A	[84]

			Ultrasonication: 90 min; CF: 3000 rpm, 30 min				
	Pyrene derivatives	Water	C_I: 6 mg mL^{-1}; Tip ultrasonication: 7 W, 1 h; CF: 5000 rpm, 4 h	0.8-1	Thickness: 2-4 layers	N/A	[85]
	Gelatin	Water	C_I: 100 mg mL^{-1}; Bath ultrasonication: 80 h; CF: 4000 rpm, 10 min	0.6	Lateral size: 0.57 μm Thickness: 2.19 nm	N/A	[86]
	Gum arabic	Water	C_I: 10 mg mL^{-1}; Bath ultrasonication: 100 h; CF: 500 rpm, 30 min	0.5-0.6	N/A	N/A	[87]
	HBPE	THF	C_I: 2 mg mL^{-1}; Bath ultrasonication: 70 W, 48 h; CF: 2000 rpm, 45 min	0.14-0.3	Lateral size: 200-500 nm Thickness: ~2.2 nm	I_d/I_g = 0.25	[74]
	I_3C-CI_3	Water	C_I: 2.5 mg ml^{-1}; Bath ultrasonication: 40 kHz, 24 h; CF: 8000 rpm, 90 min	0.03	Thickness: 5-6 layers	N/A	[88]
	2,3,6,7,10,11-hexahydroxytriphenylene	Water	C_I: 2.5 mg mL^{-1}; Bath ultrasonication:72 h; CF: 3000 g (1029 g), 1 h	0.19	Lateral size: ~150 nm	I_d/I_g< 0.35	[76]
	1-pyrenesulfonic	Water	C_I: 3 mg ml^{-1};	~0.05	Lateral size: 200-400 nm	N/A	[89]

	acid sodium salt		Bath ultrasonication: 80 min; CF: 1000 rpm, 20 min, then 12000 rpm, 20 min				
	Chlorosulphonic acid	Water	C_I: 2 mg mL^{-1}; CF: 5000 rpm, 12 h	~ 2	Lateral size: 300-900 nm Thickness: 0.5 nm	N/A	[90]
	Vmh2 hydrophobin	Ethanol/water	C_I: 100 μg mL^{-1}; Tip ultrasonication: 120 W, 7 h; CF: 40 g, 40 min	~ 0.44-0.51	N/A	N/A	[91]
	Pullulan	Water	C_I: 50 mg mL^{-1}; Tip ultrasonication: 200 W, 10-60 min; CF: 1500 rpm, 60 min, 5000 rpm, 20 min	2.3	Thickness: < 5 layers	N/A	[92]
	Chitosan	Water	C_I: 20 mg mL^{-1}; Tip ultrasonication: 200 W, 10-60 min; CF: 1500 rpm, 60 min, 5000 rpm, 20 min	5.5	Thickness: 10-15 nm	N/A	[92]
	DNA	Water	C_I: 10-150 mg mL^{-1}; Tip ultrasonication: 750 W, 6 h; CF: 2500 rpm, 30 min, followed by 5000 rpm, 30 min	2.29	Lateral size: 235 nm Thickness: 1.3 nm	N/A	[93]
	Py-ssDNA	Water	C_I: ~0.17 mg mL^{-1}; Tip ultrasonication: 70 W, 8 h; CF: 500 rpm, 1 h	N/A	Lateral size: 100 nm-4 μm	N/A	[94]
	Flavin	Water	C_I: 30 mg mL^{-1};	50	N/A	N/A	[95]

	mononucleotide		Tip ultrasonication: 40 kHz, 5 h; CF: 1500-2300 rpm, 20 min				
	Alginate	Water	C_I: 50 mg mL^{-1}; Tip ultrasonication: 200 W, 50% amplitude, 10-60 min; CF: 1500 rpm, 60 min, then 5000 rpm, 20 min	0.18	Thickness: 1.3-5.5 nm	N/A	[92]
	NaOH	NMP	C_I: 5 mg ml^{-1}; Bath ultrasonication: 1.5 h; CF: 3000 rpm, 60 min	N/A	Thickness: 1-5 nm	N/A	[96]
	Porphyrin	NMP	C_I: 0.1 mg ml^{-1}; Ultrasonication: 30 min; CF: 500 rpm, 90 min	0.05	N/A	N/A	[97]
	Ag nanoparticles	Water	C_I: 5 mg mL^{-1}; Ice-water bath ultrasonication: 100 W, 35 kHz, 48 h; CF: 2000 rpm, 30 min	N/A	N/A	I_d/I_g = 0.68	[98]
	Graphene oxide	water	C_I: 1.5 mg ml^{-1}; Ultrasonication: 150 W, 10 h; CF:4200 rpm 1 h	N/A	Thickness: 1-5 layers	I_d/I_g = 0.12	[99]
	Gum arabic	Water	C_I: 10 mg ml^{-1}; Bath ultrasonication: 100 h; CF: 500 rpm, 30 min	0.5-0.6	N/A	N/A	[87]

	Gum arabic	Water	C_I: 140 mg ml^{-1}; Ultrasonication: 1 h; CF: 4000 rpm, 30 min	~0.51	N/A	N/A	[100]
MoS_2	Graphene oxide	Water	Ultrasonication: 40 h; CF:2000 rpm, 20 min	0.25	Thickness: 1-3 layers	N/A	[101]
	MoS_2 quantum dots	NMP	C_I: 10 mg mL^{-1}; Bath ultrasonication: 3.5 h; CF: 5500 rpm, 90 min	N/A	Thickness: ~1 nm	N/A	[102]
	NaOH	NMP	C_I: 1-50 mg mL^{-1}; Bath ultrasonication: 200 W, 40 kHz, 2 h; CF: 2000 rpm, 30 min	0.6	Thickness: 30-90 nm	N/A	[103]
	Hydrazine	IPA/water	C_I: 5 mg mL^{-1}; Bath ultrasonication; CF: 7000 rpm, 15 min, then 7000 rpm, 10 min	1.48	Lateral size: 40-100 nm Thickness: 1-10 nm	N/A	[104]
	GelatinGelatin	Water	C_I: 50 mg mL^{-1}; Bath ultrasonication: 80 h; CF: 4000 rpm, 10 min	0.8	N/A	N/A	[86]
	Butylamine	NMP	C_I: 10-50 mg mL^{-1}; Tip ultrasonication: 100 W, 30 kHz, 1-8 h; CF: 1500 rpm, 30 min	~ 19	N/A	N/A	[105]
	Guar gum	Water	C_I: 4 mg mL^{-1};	0.24	Thickness: 3-5 nm	N/A	[106]

			Bath ultrasonication: 8 h; CF: 3000 rpm, 30 min		Lateral size: 300 nm		
	Thioglycolic acid	Water	C_I: 16 mg mL^{-1}; Ultrasonication: 400 W, 2 h; CF: 1500 rpm	3.49	Lateral size: < 100 nm	N/A	[107]
	Chitosan	Water	Bath ultrasonication: 5 h; CF: 4000 rpm, 10 min	0.85	N/A	N/A	[108]
	Xanthan gum(XG)	Water	C_I: 4 mg ml^{-1}; Tip ultrasonication: 38% or 50% amplitude, 1 h; CF: 5000 rpm, 30 min	0.06	Thickness: 5-6 nm	N/A	[106]
WS_2	Gelatin	Water	C_I: 50 mg mL^{-1}; Bath ultrasonication: 80 h; CF: 4000 rpm, 10 min	0.9	N/A	N/A	[86]
	ssDNA	Water	C_I: 2 mg mL^{-1}; Tip ultrasonication: 700 W, 3 h; CF: 1000-13000 rpm, 20-40 min	0.87	N/A	N/A	[109]
WSe_2	ssDNA	Water	C_I: 2 mg mL^{-1}; Tip ultrasonication: 700 W, 3 h; CF: 1000-13000 rpm, 20-40 min	0.81	N/A	N/A	[109]

h-BN	GelatinGelatin	Water	C_I: 50 mg mL^{-1}; Bath ultrasonication: 80 h; CF: 4000 rpm, 10 min	1.4	N/A	N/A	[86]
	Pyrenesulfonic acid	N,N-dimethyl formamide	C_I: 1 mg ml^{-1}; Ultrasonication: 10 h; CF: 3000 rpm, 15 min	N/A	N/A	N/A	[110]

1. H. Y, N. V, L. M, B. FM, S. Z, D. S, M. IT, H. B, B. M, G. K. YK, B. JJ, N. P, D. G, K. S, G. R, H. J, S. V, F. AC and C. JN, *Nat Nanotechnol*, 2008, 3, 563-568.
2. U. Khan, H. Porwal, A. O'Neill, K. Nawaz, P. May and J. N. Coleman, *Langmuir*, 2011, 27, 9077-9082.
3. M. V. Bracamonte, G. I. Lacconi, S. E. Urreta and L. E. F. F. Torres, *J Phys Chem C*, 2014, 118, 15455-15459.
4. U. Khan, A. O'Neill, M. Lotya, S. De and J. N. Coleman, *Small*, 2010, 6, 864-871.
5. S. Haar, A. Ciesielski, J. Clough, H. F. Yang, R. Mazzaro, F. Richard, S. Conti, N. Merstorf, M. Cecchini, V. Morandi, C. Casiraghi and P. Samori, *Small*, 2015, 11, 1691-1702.
6. Y. Hernandez, M. Lotya, D. Rickard, S. D. Bergin and J. N. Coleman, *Langmuir*, 2010, 26, 3208-3213.

7. A. O'Neill, U. Khan, P. N. Nirmalraj, J. Boland and J. N. Coleman, *The Journal of Physical Chemistry C*, 2011, 115, 5422-5428.

8. C. E. Hamilton, J. R. Lomeda, Z. Z. Sun, J. M. Tour and A. R. Barron, *Nano Lett*, 2009, 9, 3460-3462.

9. E. Y. Choi, W. S. Choi, Y. B. Lee and Y. Y. Noh, *Nanotechnology*, 2011, 22, 365601.

10. U. Halim, C. R. Zheng, Y. Chen, Z. Lin, S. Jiang, R. Cheng, Y. Huang and X. Duan, *Nat Commun*, 2013, 4, 2213.

11. A. B. Bourlinos, V. Georgakilas, R. Zboril, T. A. Steriotis and A. K. Stubos, *Small*, 2009, 5, 1841-1845.

12. Y. Wang, Z. Shi, J. Fang, H. Xu, X. Ma and J. Yin, *J. Mater. Chem.*, 2011, 21, 505-512.

13. S.-L. Zhang, Z. Zhang and W.-C. Yang, *Appl Surf Sci*, 2016, 360, 323-328.

14. J. R. Brent, N. Savjani, E. A. Lewis, S. J. Haigh, D. J. Lewis and P. O'Brien, *Chem Commun*, 2014, 50, 13338-13341.

15. J. Kang, J. D. Wood, S. A. Wells, J. H. Lee, X. L. Liu, K. S. Chen and M. C. Hersam, *Acs Nano*, 2015, 9, 3596-3604.

16. S. Lin, S. Liu, Z. Yang, Y. Li, T. W. Ng, Z. Xu, Q. Bao, J. Hao, C.-S. Lee, C. Surya, F. Yan and S. P. Lau, *Adv Funct Mater*, 2016, 26, 864-871.

17. D. J. Late, *Micropor Mesopor Mat*, 2016, 225, 494-503.

18. D. Li, A. E. Del Rio Castillo, H. Jussila, G. Ye, Z. Ren, J. Bai, X. Chen, H. Lipsanen, Z. Sun and F. Bonaccorso, *Applied Materials Today*, 2016, 4, 17-23.

19. D. Hanlon, C. Backes, E. Doherty, C. S. Cucinotta, N. C. Berner, C. Boland, K. Lee, A. Harvey, P. Lynch, Z. Gholamvand, S. F. Zhang, K. P. Wang, G. Moynihan, A. Pokle, Q. M. Ramasse, N. McEvoy, W. J. Blau, J. Wang, G. Abellan, F. Hauke, A. Hirsch, S. Sanvito, D. D. O'Regan, G. S. Duesberg, V. Nicolosi and J. N. Coleman, *Nat Commun*, 2015, 6, 8563.

20. C. X. Hao, B. C. Yang, F. S. Wen, J. Y. Xiang, L. Li, W. H. Wang, Z. M. Zeng, B. Xu, Z. S. Zhao, Z. Y. Liu and Y. J. Tian, *Adv Mater*, 2016, 28, 3194-3201.

21. Z. N. Guo, H. Zhang, S. B. Lu, Z. T. Wang, S. Y. Tang, J. D. Shao, Z. B. Sun, H. H. Xie, H. Y. Wang, X. F. Yu and P. K. Chu, *Adv Funct Mater*, 2015, 25, 6996-7002.

22. P. Yasaei, B. Kumar, T. Foroozan, C. H. Wang, M. Asadi, D. Tuschel, J. E. Indacochea, R. F. Klie and A. Salehi-Khojin, *Adv Mater*, 2015, 27, 1887-+.

23. M. Thripuranthaka, C. S. Rout and D. J. Late, *Mater Res Express*, 2014, 1.

24. E. P. Nguyen, B. J. Carey, T. Daeneke, J. Z. Ou, K. Latham, S. Zhuiykov and K. Kalantar-zadeh, *Chem Mater*, 2015, 27, 53-59.

25. W. Qiao, S. M. Yan, X. M. He, X. Y. Song, Z. W. Li, X. Zhang, W. Zhong and Y. W. Du, *Rsc Adv*, 2014, 4, 50981-50987.

26. A. O'Neill, U. Khan and J. N. Coleman, *Chem Mater*, 2012, 24, 2414-2421.

27. L. Yue, G. Pircheraghi, S. A. Monemian and I. Manas-Zloczower, *Carbon*, 2014, 78, 268-278.

28. S. L. Zhang, H. Jung, J. S. Huh, J. B. Yu and W. C. Yang, *J Nanosci Nanotechno*, 2014, 14, 8518-8522.

29. L. Dong, S. Lin, L. Yang, J. J. Zhang, C. Yang, D. Yang and H. B. Lu, *Chem Commun*, 2014, 50, 15936-15939.

30. L. Muscuso, S. Cravanzola, F. Cesano, D. Scarano and A. Zecchina, *J Phys Chem C*, 2015, 119, 3791-3801.

31. C. Backes, N. C. Berner, X. Chen, P. Lafargue, P. LaPlace, M. Freeley, G. S. Duesberg, J. N. Coleman and A. R. McDonald, *Angew Chem* 2015, 54, 2627-2680.

32. V. Forsberg, R. Zhang, J. Backstrom, C. Dahlstrom, B. Andres, M. Norgren, M. Andersson, M. Hummelgard and H. Olin, *Plos One*, 2016, 11, e0154522.

33. Y. G. Yao, L. Tolentino, Z. Z. Yang, X. J. Song, W. Zhang, Y. S. Chen and C. P. Wong, *Adv Funct Mater*, 2013, 23, 3577-3583.

34. K. G. Zhou, N. N. Mao, H. X. Wang, Y. Peng and H. L. Zhang, *Angewandte Chemie*, 2011, 50, 10839-10842.

35. L. Guardia, J. I. Paredes, R. Rozada, S. Villar-Rodil, A. Martínez-Alonso and J. M. D. Tascón, *Rsc Adv*, 2014, 4, 14115.

36. P. Ma and J. T. Spencer, *J Mater Sci*, 2014, 50, 313-323.

37. Y. Wang, Z. Shi and J. Yin, *J Mater Chem*, 2011, 21, 11371.

38. X. Wang, P. F. Fulvio, G. A. Baker, G. M. Veith, R. R. Unocic, S. M. Mahurin, M. Chi and S. Dai, *Chem Commun (Camb)*, 2010, 46, 4487-4489.

39. R. Bari, G. Tamas, F. Irin, A. J. A. Aquino, M. J. Green and E. L. Quitevis, *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 2014, 463, 63-69.

40. D. Nuvoli, L. Valentini, V. Alzari, S. Scognamillo, S. B. Bon, M. Piccinini, J. Illescas and A. Mariani, *J. Mater. Chem.*, 2011, 21, 3428-3431.

41. W. C. Zhao, Z. M. Xue, J. F. Wang, J. Y. Jiang, X. H. Zhao and T. C. Mu, *Acs Appl Mater Inter*, 2015, 7, 27608-27612.

42. T. Morishita, H. Okamoto, Y. Katagiri, M. Matsushita and K. Fukumori, *Chem Commun*, 2015, 51, 12068-12071.

43. A. A. Green and M. C. Hersam, *Nano Lett*, 2009, 9, 4031-4036.

44. M. Lotya, P. J. King, U. Khan, S. De and J. N. Coleman, *Acs Nano*, 2010, 4, 3155-3162.

45. S. De, P. J. King, M. Lotya, A. O'Neill, E. M. Doherty, Y. Hernandez, G. S. Duesberg and J. N. Coleman, *Small*, 2010, 6, 458-464.

46. P. Ramalingam, S. T. Pusuluri, S. Periasamy, R. Veerabahu and J. Kulandaivel, *Rsc Adv*, 2013, 3, 2369.

47. L. Guardia, M. J. Fernandez-Merino, J. I. Paredes, P. Solis-Fernandez, S. Villar-Rodil, A. Martinez-Alonso and J. M. D. Tascon, *Carbon*, 2011, 49, 1653-1662.

48. L. Zhang, Z. Zhang, C. He, L. Dai, J. Liu and L. Wang, *Acs Nano*, 2014, 8, 6663-6670.

49. M. Lotya, Y. Hernandez, P. J. King, R. J. Smith, V. Nicolosi, L. S. Karlsson, F. M. Blighe, S. De, Z. Wang and I. T. Mcgovern, *J Am Chem Soc*, 2009,

131, 3611-3620.

50. S. Das, A. S. Wajid, J. L. Shelburne, Y. C. Liao and M. J. Green, *Acs Appl Mater Inter*, 2011, 3, 1844-1851.

51. Z. Y. Sun, J. Masa, Z. M. Liu, W. Schuhmann and M. Muhler, *Chem-Eur J*, 2012, 18, 6972-6978.

52. M. S. Kang, K. T. Kim, J. U. Lee and W. H. Jo, *J Mater Chem C*, 2013, 1, 1870-1875.

53. C. Yeon, J. Y. Sun, K. S. Lee and J. W. Lim, *Carbon*, 2015, 83, 136-143.

54. S. M. Notley, *Langmuir*, 2012, 28, 14110-14113.

55. Y. Yao, Z. Lin, Z. Li, X. Song, K.-S. Moon and C.-p. Wong, *J Mater Chem*, 2012, 22, 13494.

56. S. Vadukumpully, J. Paul and S. Valiyaveettil, *Carbon*, 2009, 47, 3288-3294.

57. V. M. Samoilov, E. A. Danilov, A. V. Nikolaeva, G. A. Yerpuleva, N. N. Trofimova, S. S. Abramchuk and K. V. Ponkratov, *Carbon*, 2015, 84, 38-46.

58. F. Sharifi, R. Bauld, M. S. Ahmed and G. Fanchini, *Small*, 2012, 8, 699-706.

59. B. L. Li, H. L. Zou, L. Lu, Y. Yang, J. L. Lei, H. Q. Luo and N. B. Li, *Adv Funct Mater*, 2015, 25, 3541-3550.

60. R. J. Smith, P. J. King, M. Lotya, C. Wirtz, U. Khan, S. De, A. O'Neill, G. S. Duesberg, J. C. Grunlan, G. Moriarty, J. Chen, J. Wang, A. I. Minett, V. Nicolosi and J. N. Coleman, *Adv Mater*, 2011, 23, 3944-3948.

61. A. Gupta, V. Arunachalam and S. Vasudevan, *J Phys Chem Lett*, 2015, 6, 739-744.

62. X. Y. Yu, M. S. Prevot and K. Sivula, *Chem Mater*, 2014, 26, 5892-5899.

63. Z. Gholamvand, D. McAteer, C. Backes, N. McEvoy, A. Harvey, N. C. Berner, D. Hanlon, C. Bradley, I. Godwin, A. Rovetta, M. E. Lyons, G. S. Duesberg and J. N. Coleman, *Nanoscale*, 2016, 8, 5737-5749.

64. C. Backes, B. M. Szydlowska, A. Harvey, S. Yuan, V. Vega-Mayoral, B. R. Davies, P. L. Zhao, D. Hanlon, E. J. Santos, M. I. Katsnelson, W. J. Blau, C. Gadermaier and J. N. Coleman, *Acs Nano*, 2016, 10, 1589-1601.

65. A. B. Bourlinos, V. Georgakilas, R. Zboril, T. A. Steriotis, A. K. Stubos and C. Trapalis, *Solid State Communications*, 2009, 149, 2172-2176.

66. A. S. Wajid, S. Das, F. Irin, H. S. T. Ahmed, J. L. Shelburne, D. Parviz, R. J. Fullerton, A. F. Jankowski, R. C. Hedden and M. J. Green, *Carbon*, 2012, 50, 526-534.

67. P. May, U. Khan, A. O'Neill and J. N. Coleman, *J. Mater. Chem.*, 2012, 22, 1278-1282.

68. F. Zhang, X. J. Chen, R. A. Boulos, F. M. Yasin, H. B. Lu, C. Raston and H. B. Zhang, *Chem Commun*, 2013, 49, 4845-4847.

69. P. M. Carrasco, S. Montes, I. García, M. Borghei, H. Jiang, I. Odriozola, G. Cabañero and V. Ruiz, *Carbon*, 2014, 70, 157-163.

70. Z. Sun, S. Pöller, X. Huang, D. Guschin, C. Taetz, P. Ebbinghaus, J. Masa, A. Erbe, A. Kilzer and W. Schuhmann, *Carbon*, 2013, 64, 288-294.

71. J. W. T. Seo, A. A. Green, A. L. Antaris and M. C. Hersam, *J Phys Chem Lett*, 2011, 2, 1004-1008.

72. W. Liu, R. Zhou, D. Zhou, G. Ding, J. M. Soah, C. Y. Yue and X. Lu, *Carbon*, 2015, 83, 188-197.

73. J. Cui, Z. Song, L. Xin, S. Zhao, Y. Yan and G. Liu, *Carbon*, 2016, 99, 249-260.

74. L. X. Xu, J. W. McGraw, F. Gao, M. Grundy, Z. B. Ye, Z. Y. Gu and J. L. Shepherd, *J Phys Chem C*, 2013, 117, 10730-10742.

75. H. W. Shim, K. J. Ahn, K. Im, S. Noh, M. S. Kim, Y. Lee, H. Choi and H. Yoon, *Macromolecules*, 2015, 48, 6628-6637.

76. N. K. Gang Liu, *Chemphyschem*, 2016, 17, 1557-1567.

77. W. Liu, C. Zhao, R. Zhou, D. Zhou, Z. Liu and X. Lu, *Nanoscale*, 2015, 7, 9919-9926.

78. Y. Zhang, S. Liu, W. Liu, T. Liang, X. Yang, M. Xu and H. Chen, *Phys Chem Chem Phys*, 2015, 17, 27565-27572.

79. V. Vega-Mayoral, C. Backes, D. Hanlon, U. Khan, Z. Gholamvand, M. O'Brien, G. S. Duesberg, C. Gadermaier and J. N. Coleman, *Adv Funct Mater*, 2016, 26, 1028-1039.

80. U. Khan, P. May, A. O'Neill, A. P. Bell, E. Boussac, A. Martin, J. Semple and J. N. Coleman, *Nanoscale*, 2013, 5, 581-587.

81. P. He, J. Sun, S. Y. Tian, S. W. Yang, S. J. Ding, G. Q. Ding, X. M. Xie and M. H. Jiang, *Chem Mater*, 2015, 27, 218-226.

82. M. Xu, W. Zhang, Z. Yang, F. Yu, Y. Ma, N. Hu, D. He, Q. Liang, Y. Su and Y. Zhang, *Nanoscale*, 2015, 7, 10527-10534.

83. E. Eroglu, W. Zang, P. K. Eggers, X. Chen, R. A. Boulos, M. H. Wahid, S. M. Smith and C. L. Raston, *Chem Commun (Camb)*, 2013, 49, 8172-8174.

84. J. Xu, D. K. Dang, V. T. Tran, X. Liu, S. C. Jin, S. H. Hur, W. M. Choi, E. J. Kim and P. A. Kohl, *Journal of Colloid & Interface Science*, 2014, 418, 37-42.

85. D. Parviz, S. Das, H. S. Ahmed, F. Irin, S. Bhattacharia and M. J. Green, 2013.

86. Y. Ge, J. Wang, Z. Shi and J. Yin, *J Mater Chem*, 2012, 22, 17619.

87. V. Chabot, B. Kim, B. Sloper, C. Tzoganakis and A. Yu, *Sci Rep*, 2013, 3, 1378.

88. M. Cao, N. Wang, L. Wang, Y. Zhang, Y. Chen, Z. Xie, Z. Li, E. Pambou, R. Li, C. Chen, F. Pan, H. Xu, J. Penny, J. R. P. Webster and J. R. Lu, *J. Mater. Chem. B*, 2016, 4, 152-161.

89. H. Yang, Y. Hernandez, A. Schlierf, A. Felten, A. Eckmann, S. Johal, P. Louette, J. J. Pireaux, X. Feng, K. Mullen, V. Palermo and C. Casiraghi, *Carbon*, 2013, 53, 357-365.

90. N. Behabtu, J. R. Lomeda, M. J. Green, A. L. Higginbotham, A. Sinitskii, D. V. Kosynkin, D. Tsentalovich, A. N. G. Parra-Vasquez, J. Schmidt, E. Kesselman, Y. Cohen, Y. Talmon, J. M. Tour and M. Pasquali, *Nat Nanotechnol*, 2010, 5, 406-411.

91. A. M. Gravagnuolo, E. Morales-Narváez, S. Longobardi, E. T. da Silva, P. Giardina and A. Merkoçi, *Adv Funct Mater*, 2015, 25, 2771-2779.

92. I. Uysal Unalan, C. Wan, S. Trabattoni, L. Piergiovanni and S. Farris, *RSC Adv.*, 2015, 5, 26482-26490.

93. D. Joseph, S. Seo, D. R. Williams and K. E. Geckeler, *ACS Appl Mater Interfaces*, 2014, 6, 3347-3356.

94. F. Liu, J. Y. Choi and T. S. Seo, *Chem Commun (Camb)*, 2010, 46, 2844-2846.

95. M. Ayan-Varela, J. I. Paredes, L. Guardia, S. Villar-Rodil, J. M. Munuera, M. Diaz-Gonzalez, C. Fernandez-Sanchez, A. Martinez-Alonso and J. M. D. Tascon, *Acs Appl Mater Inter*, 2015, 7, 10293-10307.

96. W. W. Liu and J. N. Wang, *Chem Commun (Camb)*, 2011, 47, 6888-6890.

97. J. Geng, B. S. Kong, S. B. Yang and H. T. Jung, *Chem Commun (Camb)*, 2010, 46, 5091-5093.

98. Z. Y. Sun, N. N. Dong, K. P. Wang, D. Konig, T. C. Nagaiah, M. D. Sanchez, A. Ludwig, X. Cheng, W. Schuhmann, J. Wang and M. Muhler, *Carbon*, 2013, 62, 182-192.

99. T. T. Tung, J. Yoo, F. K. Alotaibi, M. J. Nine, R. Karunagaran, M. Krebsz, G. T. Nguyen, D. N. Tran, J. F. Feller and D. Losic, *ACS Appl Mater Interfaces*, 2016, 8, 16521-16532.

100. J. Fan, Z. Shi, Y. Ge, J. Wang, Y. Wang and J. Yin, *J Mater Chem*, 2012, 22, 13764.

101. J. Peng and J. Weng, *Carbon*, 2015, 94, 568-576.

102. D. Gopalakrishnan, D. Damien and M. M. Shaijumon, *Acs Nano*, 2014, 8, 5297-5303.

103. G. S. Bang, K. W. Nam, J. Y. Kim, J. Shin, J. W. Choi and S. Y. Choi, *Acs Appl Mater Inter*, 2014, 6, 7084-7089.

104. G. L. Liu, H. L. Ma, I. Teixeira, Z. Y. Sun, Q. N. Xia, X. L. Hong and S. C. E. Tsang, *Chem-Eur J*, 2016, 22, 2910-2914.

105. B. D. Mao, Y. B. Yuan, Y. C. Shao, B. Yang, Z. G. Xiao and J. S. Huang, *Nanosci Nanotech Let*, 2014, 6, 685-691.

106. S. Ravula, J. B. Essner and G. A. Baker, *Chemnanomat*, 2015, 1, 167–177.

107. R. Anbazhagan, H. J. Wang, H. C. Tsai and R. J. Jeng, *Rsc Adv*, 2014, 4, 42936-42941.

108. X. Feng, X. Wang, W. Xing, K. Zhou, L. Song and Y. Hu, *Compos Sci Technol*, 2014, 93, 76-82.

109. G. S. Bang, S. Cho, N. Son, G. W. Shim, B. K. Cho and S. Y. Choi, *ACS Appl Mater Interfaces*, 2016, 8, 1943-1950.

110. K. H. Oh, D. Lee, M. J. Choo, K. H. Park, S. Jeon, S. H. Hong, J. K. Park and J. W. Choi, *ACS Appl Mater Interfaces*, 2014, 6, 7751-7758.