Supporting Information

Carbon quantum dots (CQDs) modified polymers: a mini review of non-optical applications

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Table S1. Summary of recent works related to CQDs modified polymers.

Sr. #	Precursors	Method	Temp.	Time	Polymer Matrix	Dispersion Technique	Optimum conc.	Ref.
Smart Polymers								
1	Cellulose fibers, ammonia	Hydrothermal	200 °C	4 h	PVA	Blending	1 wt.%	[1]
2	Phenylboronic acid, NaOH, water	Hydrothermal	220 °C	12 h	PVA	Mixing	1 wt.%	[2]
3	Yeast powder, water	Hydrothermal	200 °C	8 h	PVA	Mixing	2 vol%	[3]
4	Sodium citrate, EDA, water	Hydrothermal	160 °C	8 h	PVA, agarose, CS, glycerin	Mixing	3 vol%	[4]
5	Poly(L-lysine)	Hydrothermal	240 °C	3 h	Oxidized dextran (ODA)	Mixing	15 w/v%	[5]
6	Glutaraldehyde, ethanol	Hydrothermal	150 °C	2 h	PEI	Schiff base reaction	2 wt%	[6]
7	CA, urea, water	Microwave	700 W	10 min	Agar and pAM	Heating-cooling photopolymerization	1 wt.%	[7]
8	Cotton fibers, urea, water	Hydrothermal	200 °C	15 h	PVDF-HFP	Mixing	0.13 wt.%	[8]
9	Purchase from Nanjing, China	Commercially	Commercial	Commercial	PDLA and PLLA	Mixing	1 wt.%	[9]
10	Purchase from Nanjing, China	Commercially	Commercial	Commercial	PVDF	Mixing	1 wt.%	[10]
11	Lignocellulose, magnesium hydroxide,	Hydrothermal	225 °C	10 h	PVA	Mixing	1 wt.%	[11]

	EDA, water							
Mechanically enhanced polymer								
12	Banana, water, ethanol	Microwave	150 °C	4 h	Epoxy resin	Mixing	0.5 wt.%	[12]
13	Banana, water, ethanol	Microwave	150 °C	4 h	Epoxy resin	Mixing	1.5 wt.%	[13]
14	Paddy straw, HCL	Hydrothermal	160 °C	6 h	Epoxy resin	Mixing	0.1 vol%	[14]
15	CA, 2-aminothiophenol, water	Hydrothermal	170 °C	3 h	TPU	In-situ polymerization	1 wt.%	[15]
16	Banana juice, ethanol	Heating plup method	150 °C	4 h	WTPU	In-situ polymerization	1 wt.%	[16]
17	Coal, H_2SO_4, HNO_3	Chemical oxidation	120 °C	24 h	PAN	Mixing	1 wt%	[17]
18	CA, urea, phytic acid, water	Hydrothermal	180 °C	8 h	CS	Mixing	2 wt.%	[18]
19	CA, urea	Heated method	200 °C	25 min	CR	Two roll mill mixing	6 wt.%	[19]
20	Diammonium citrate, glycine	Pyrolysis method	120 °C	10-15 min	XSBR	Mixing	0.8 phr	[20]
21	CA, KH_2PO_4, EDA	Microwave irradiation	700 W	9 min	SBR	Two-roll mill	20 phr	[21]
Membranes								
22	CA, diethylenetriamine, water	Microwave irradiation	750 W	5 min	Poly(ether-b-amide)	Mixing	1 wt%	[22]
23	CA, diethylenetriamine	Microwave irradiation	Commercial	Commercial	Nafion	Mixing	5%	[23]
24	Glucose, KH_2PO_4	Hydrothermal	200 °C	12 h	PSF	Interfacial polymerization	0.02 wt%	[24]

25	Rice husk, EDA, ascorbic acid	Hydrothermal	190 °C	12 h	PSF	Mixing	0.05%	[25]
26	Glucose, PEG	Hydrothermal	180 °C	20 h	PES	Mixing	1 wt%	[26]
27	EDA, CA	Hydrothermal	150 °C	5 h	PVA	Mixing	0.2%	[27]
28	Commercial	Hydrothermal	Commercial	Commercial	PAN/Polycaprolactone	Mixing	4 wt.%	[28]
Textile fibers								
29	CS, acetic acid	Hydrothermal	180 °C	8 h	PP	Melt spinning process	0.5 wt.%	[29]
30	Polyoxyethylene-polyoxypropylene-polyoxyethylene, phosphoric acid, water, toluene	Heated on magnetic stirrer	250 °C	2 h	PCL	Mixing	0.22 wt.%	[30]
31	CA, EDA, borax	Hydrothermal	180 °C	5 h	Cotton fabric, EPTC	Grafting	-NA-	[31]
32	CA, thiourea, folic acid	Hydrothermal	200 °C	6 h	PEO	Mixing	4 wt%	[32]
Functional aspects								
33	CA, dodeclyamine (DDA)	Pyrolysis	200 °C	2.5 h	PS	Pickering emulsion polymerization	2 wt%	[33]
34	CA	Carbonization	200 °C	15 min	PU	One-pot polymerization	3 wt%	[34]
35	CA, sodium citrate	Electrochemical method	190 mA current	24 h	Carbopol	Mixing	1 wt%	[35]
36	CS, acetic acid, water	Pyrolysis method	130° C	10 to 15 h	PVA/PEG	Mixing	0.8 wt%	[36]

37	Starch, water	Microwave radiation	1000 W	5 min	COEp	Mixing	3 wt%	[37]
38	Starch, water	Microwave radiation	1000 W	5 min	EP/PU	Mixing	3 wt%	[38]

Table S2. Comparison of pure polymers and CQDs-reinforced polymers.

Sr.	Pure Polymers	CQDs-reinforced polymers	Ref.
1	PVA Regain only 20% after 270S	PVA/CQDs Completely regain after 180S	[1]
2	PVA Not recover the original shape after 180S	PVA/CQDs Completely regain after 180S	[3]
3	PVA/agarose/CS/glycerin Not healed after breaking	PVA/agarose/CS/glycerin/CQDs Healed and more than ten times extendable after healing	[4]
4	ODA Not healed, fast bacterial growth	PL-CD@ODA Completely healed, antibacterial	[5]
5	Agar/pAM Tensile strength 0.18 MPa and strain 420%	Agar/pAM/CQDs Tensile strength 1.68 MPa and strain 1400%	[7]

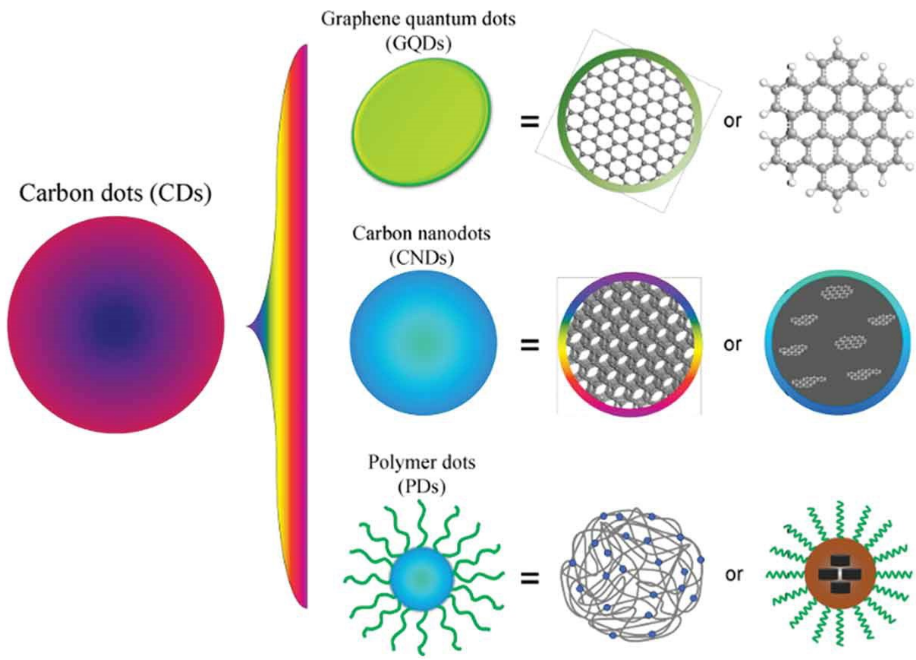

Figure S1. Detailed structures of different QDs including GQD, CQDs, and PQDs [39].

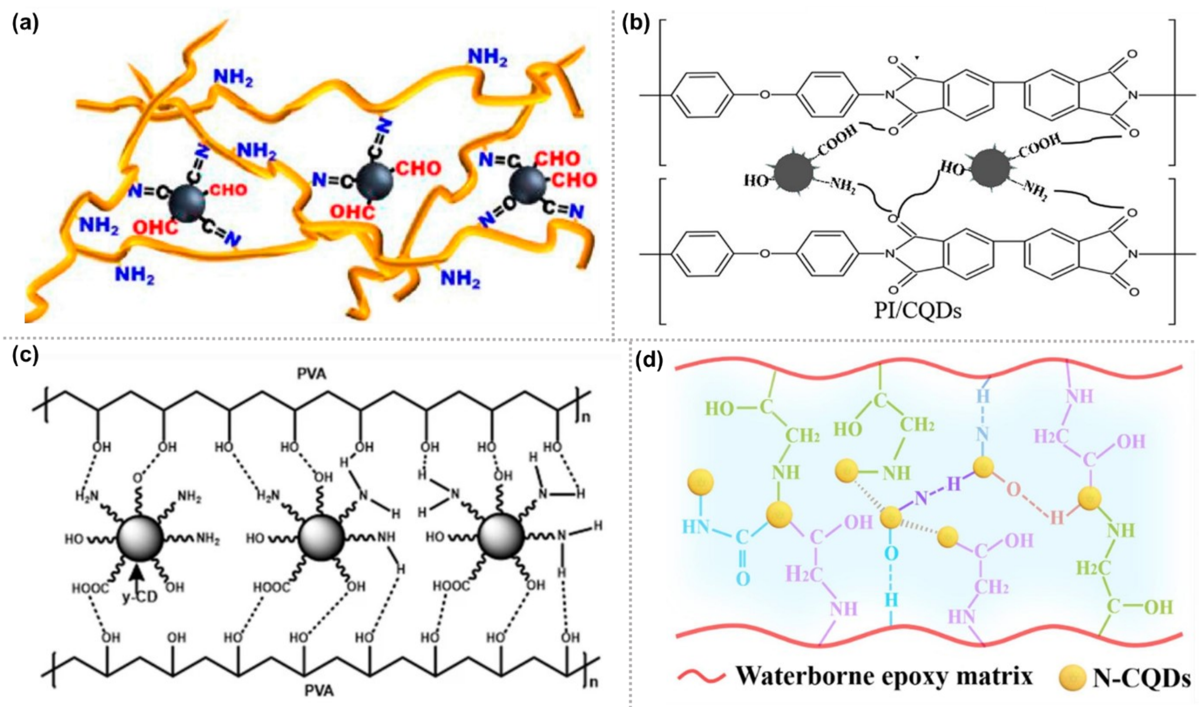

Figure S2. Shows the different interactions of polymer with CQDs (a) PEI/CQDs [40], (b) PI/CQDs [41], (c) PVA/CQDs [42], and (d) epoxy/CQDs [43].

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