

Supplementary Information for

An Inkjet-Printable Microemulsion System for Colorimetric Polydiacetylene Supramolecules on Paper Substrates

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	TOL	XYL	CH	TMB
PCDA				
PCDA-AEE				
PCDA-EDEA				
4BCMU				

Table S1. Quality images obtained with various combinations of DA monomers, organic solvents and surfactants (a: SDS, b: CTAB, c: Brij 78).

	Unit	Value
Viscosity (at 25 °C)	cP	4.12-4.35
Density (at 23 °C)	g/cm ³	0.898-0.899
Surface Tension (at 25 °C)	dyne/cm	25.03-25.11

Table S2. Viscosity, density and surface tension of a PCDA emulsion.

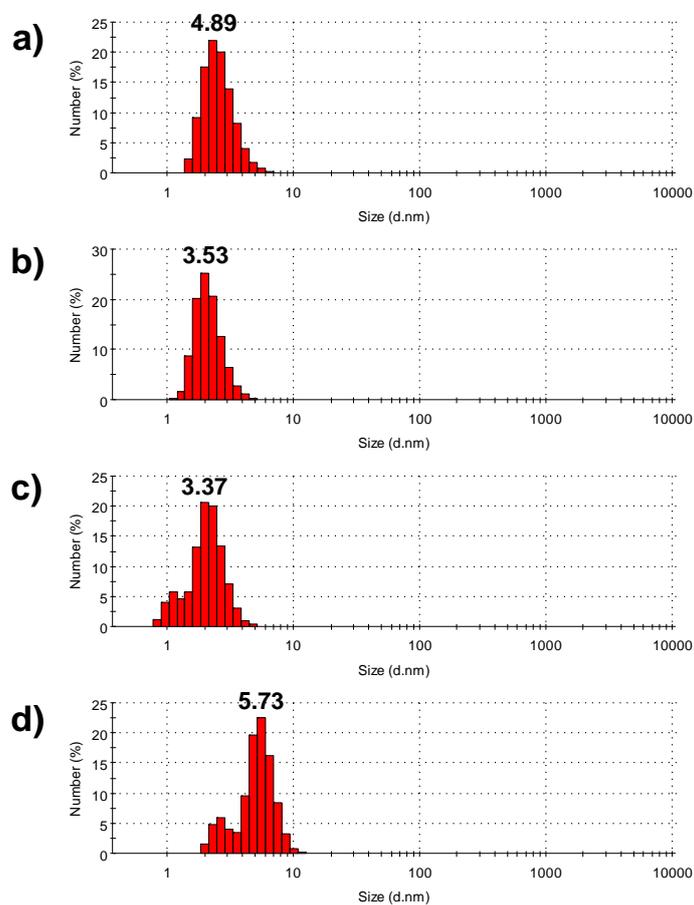


Fig. S1. Size distributions of emulsions derived from PCDA (a), PCDA-AEE (b), PCDA-EDEA (c), and 4BCMU (d). Ink composition (DA monomer (2 wt%), 1,2,4-trimethylbenzene (24 wt%), SDS (10 wt%), 1-propanol (38 wt%), water (26 wt%)).

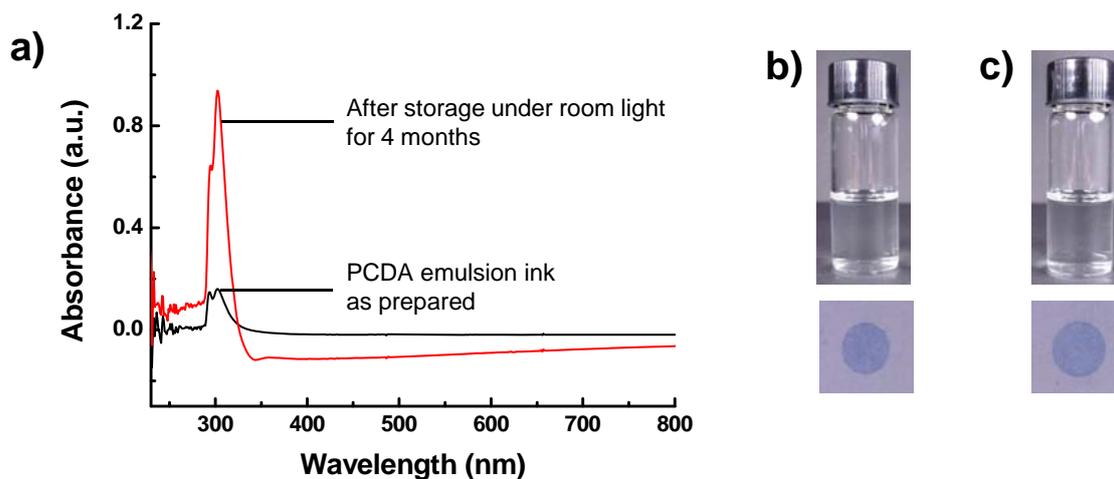


Fig. S2. (a) UV-vis spectra of a PCDA emulsion as prepared and after storage under room light for 4 months. (b and c) Photographs of PCDA emulsions and printed images obtained with the emulsion ink as prepared (b) and after storage under room light for 4 months (c). Ink composition (PCDA (2 wt%), 1,2,4-trimethylbenzene (24 wt%), SDS (10 wt%), 1-propanol (38 wt%), water (26 wt%)).

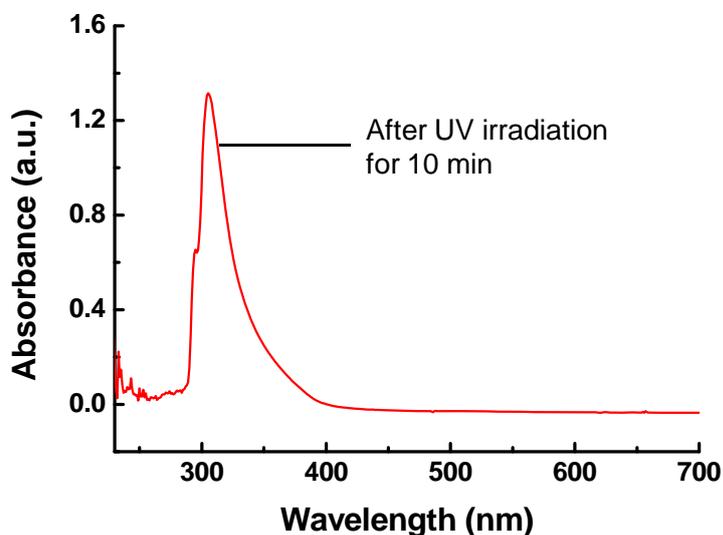


Fig. S3. UV-Vis spectrum of PCDA emulsion upon 254 nm UV irradiation (1 mW/cm^2) for 10 min. Ink composition (PCDA (2 wt%), 1,2,4-trimethylbenzene (24 wt%), SDS (10 wt%), 1-propanol (38 wt%), water (26 wt%)).

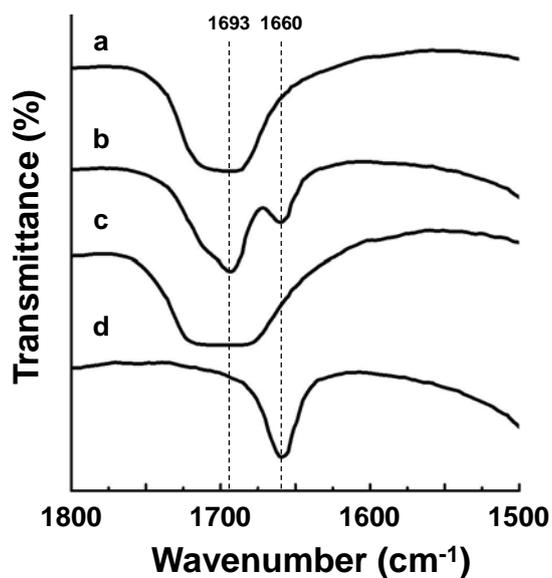


Fig. S4. FTIR spectra of (a) commercial PCDA powder, (b) dried PCDA emulsion, (c) after extensive washing the dried PCDA emulsion with water, and (d) SDS.

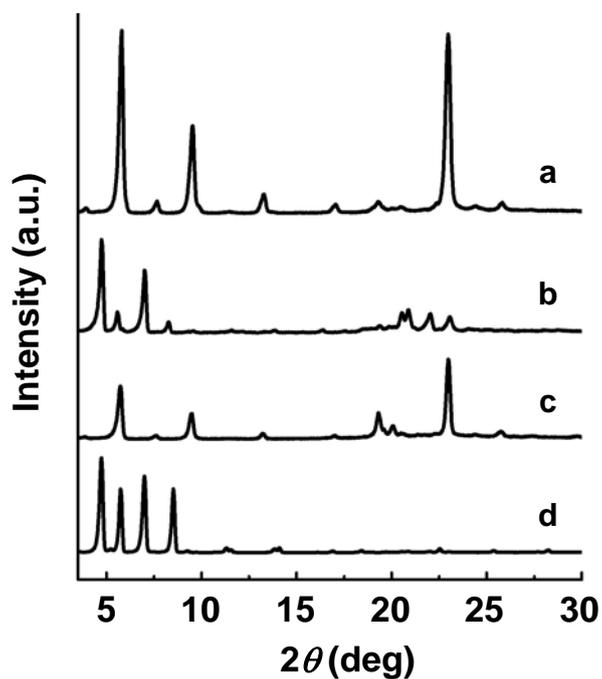


Fig. S5. XRD analysis of (a) commercial PCDA powder, (b) dried PCDA emulsion, (c) after extensive washing the dried PCDA emulsion with water, and (d) SDS.

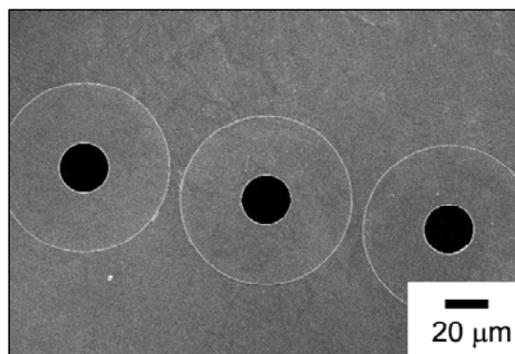


Fig. S6. SEM image of the print head of inkjet printer HP Deskjet D2360.



Fig. S7. Photographs of printed images on an A4-sized paper with an emulsion type PCDA ink solution using an office ink-jet printer (left) at monomer state, (middle) after UV-irradiation (3 min) and (right) after heat treatment using a portable heat-gun. The printed letters, (left) invisible at monomer state, (middle) become blue when UV-irradiated and (right) shift color to red instantaneously when heated at 95 °C. Ink composition (PCDA (2 wt%), 1,2,4-trimethylbenzene (24 wt%), SDS (10 wt%), 1-propanol (38 wt%), water (26 wt%)).

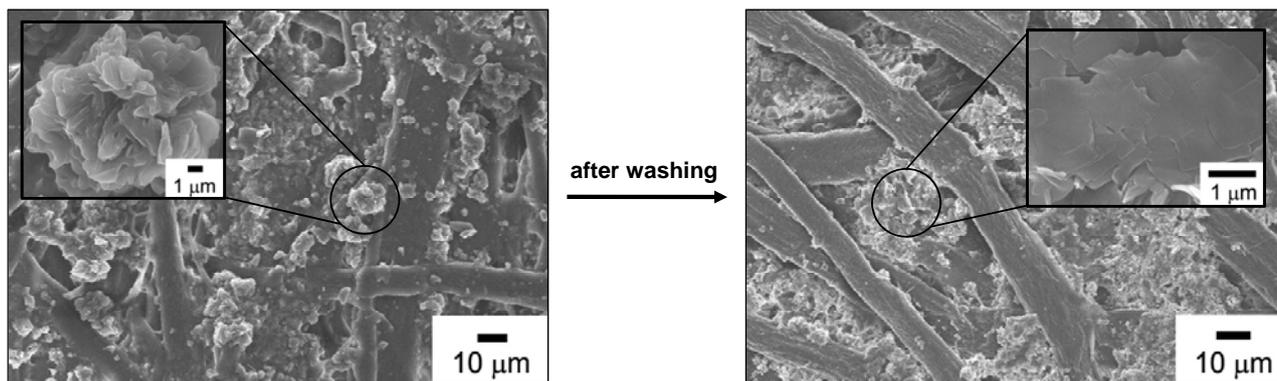


Fig. S8. SEM image of PDA fabricated on a paper using a PCDA emulsion ink suspension (left) before and (right) after washing the paper with water. Ink composition (PCDA (2 wt%), 1,2,4-trimethylbenzene (24 wt%), SDS (10 wt%), 1-propanol (38 wt%), water (26 wt%)).

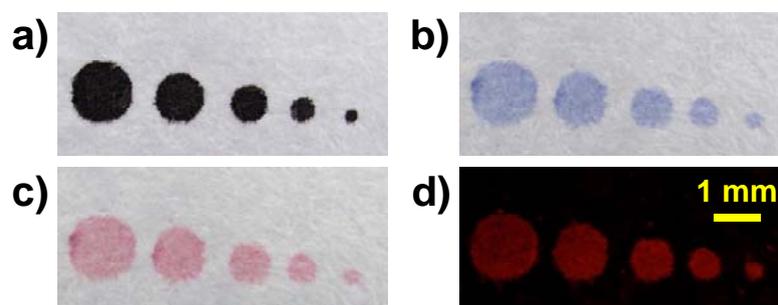


Fig. S9. (a-c) Optical and (d) fluorescence microscope images of printed lines using (a) a black ink and (b-d) a PCDA-derived emulsion ink, (b) as printed and (c and d) after heat treatment. Ink composition (PCDA (2 wt%), 1,2,4-trimethylbenzene (24 wt%), SDS (10 wt%), 1-propanol (38 wt%), water (26 wt%)).

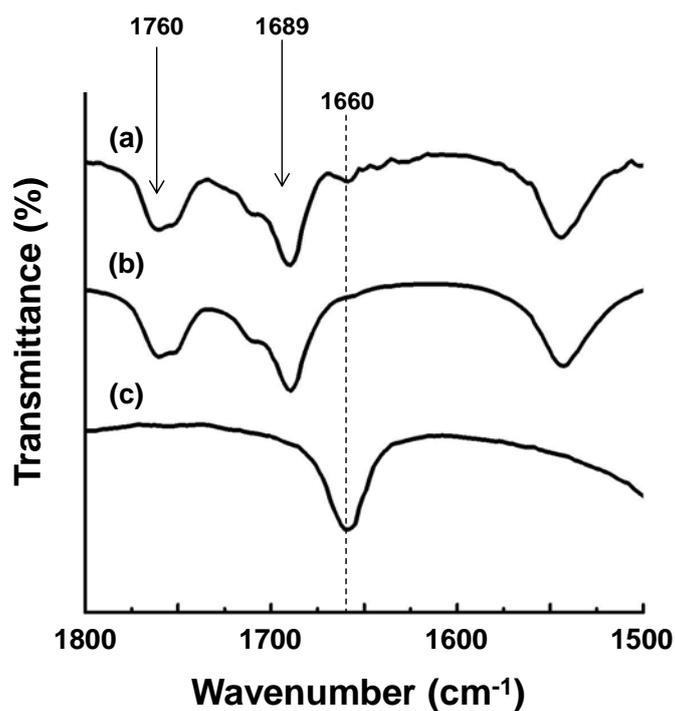


Fig. S10. FTIR spectra of (a) dried 4BCMU emulsion, (b) after extensive washing the dried 4BCMU emulsion with water, and (c) SDS.

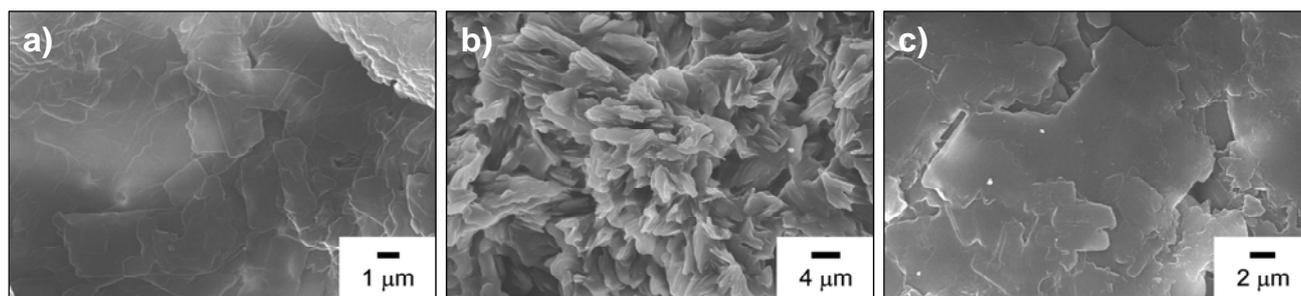


Fig. S11. SEM images of (a) a 4BCMU powder, (b) 4BCMU microemulsion solution, and (c) after removal of surfactants from the emulsion droplets. Ink composition (4BCMU (4 wt%), 1,2,4-trimethylbenzene (23 wt%), SDS (10 wt%), 1-propanol (37 wt%), water (26 wt%)).

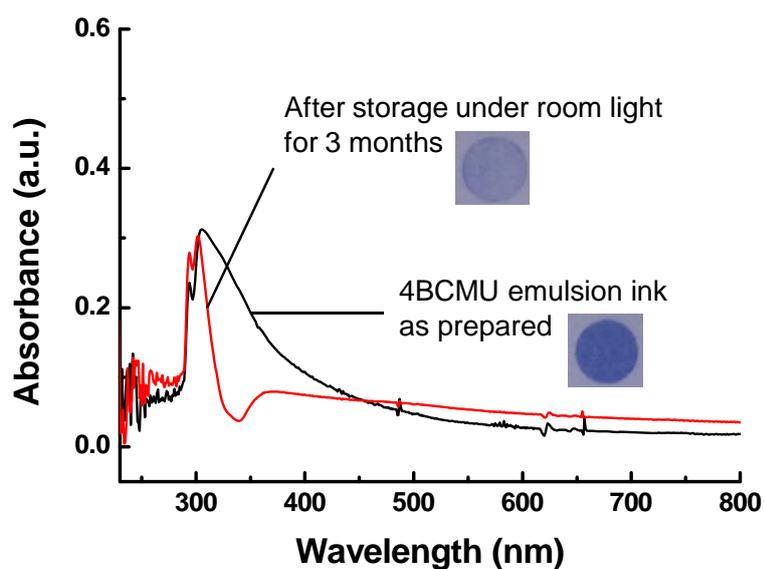


Fig. S12. UV-vis spectra of a 4BCMU emulsion as prepared and after storage under room light for 3 months. Photographs of printed images are also displayed. Ink composition (4BCMU (4 wt%), 1,2,4-trimethylbenzene (23 wt%), SDS (10 wt%), 1-propanol (37 wt%), water (26 wt%)).