

# **Copper quantum dot/polyacrylamide composite nanospheres: spreading on quartz flake surfaces and displacing crude oil in microchannel chips**

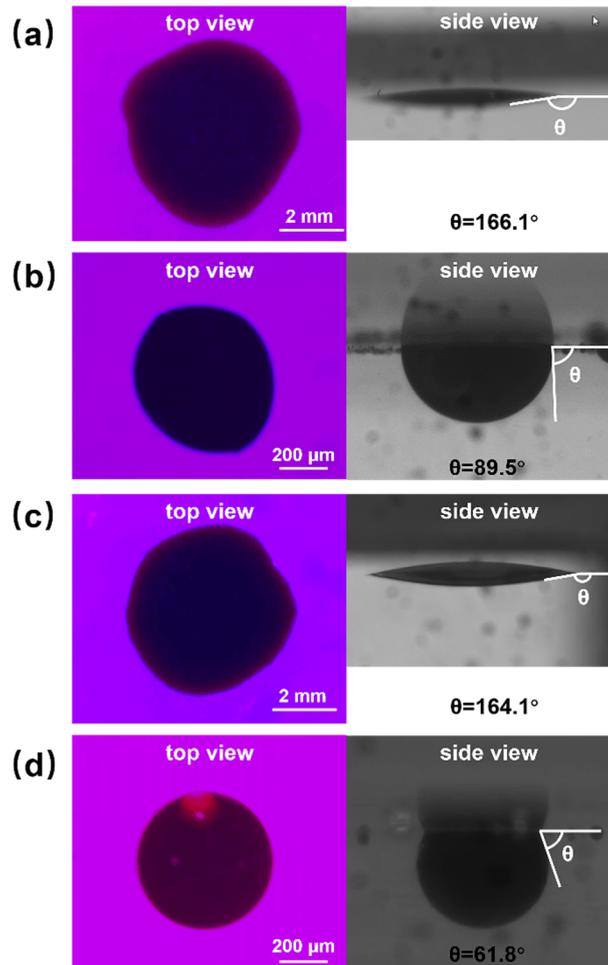
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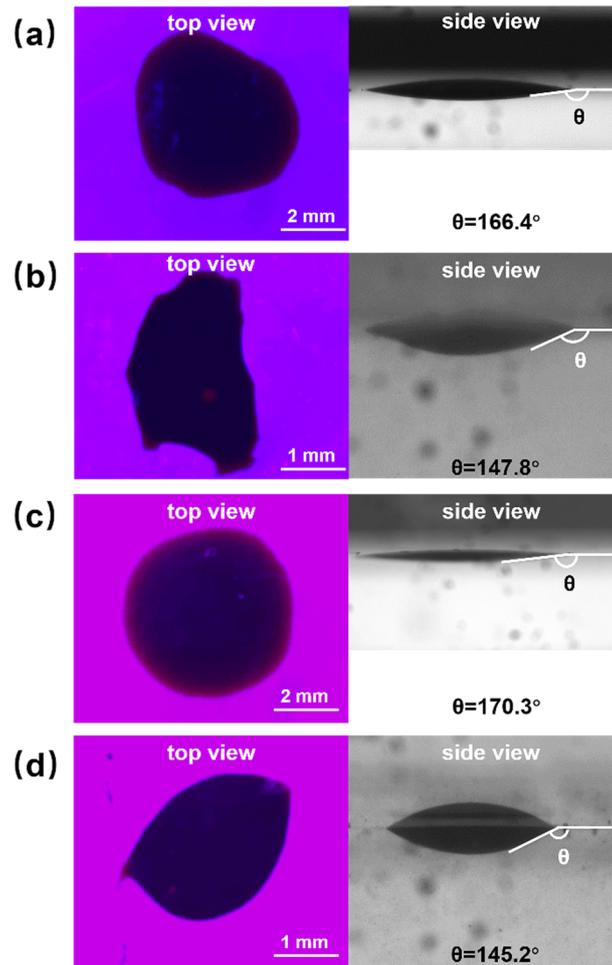
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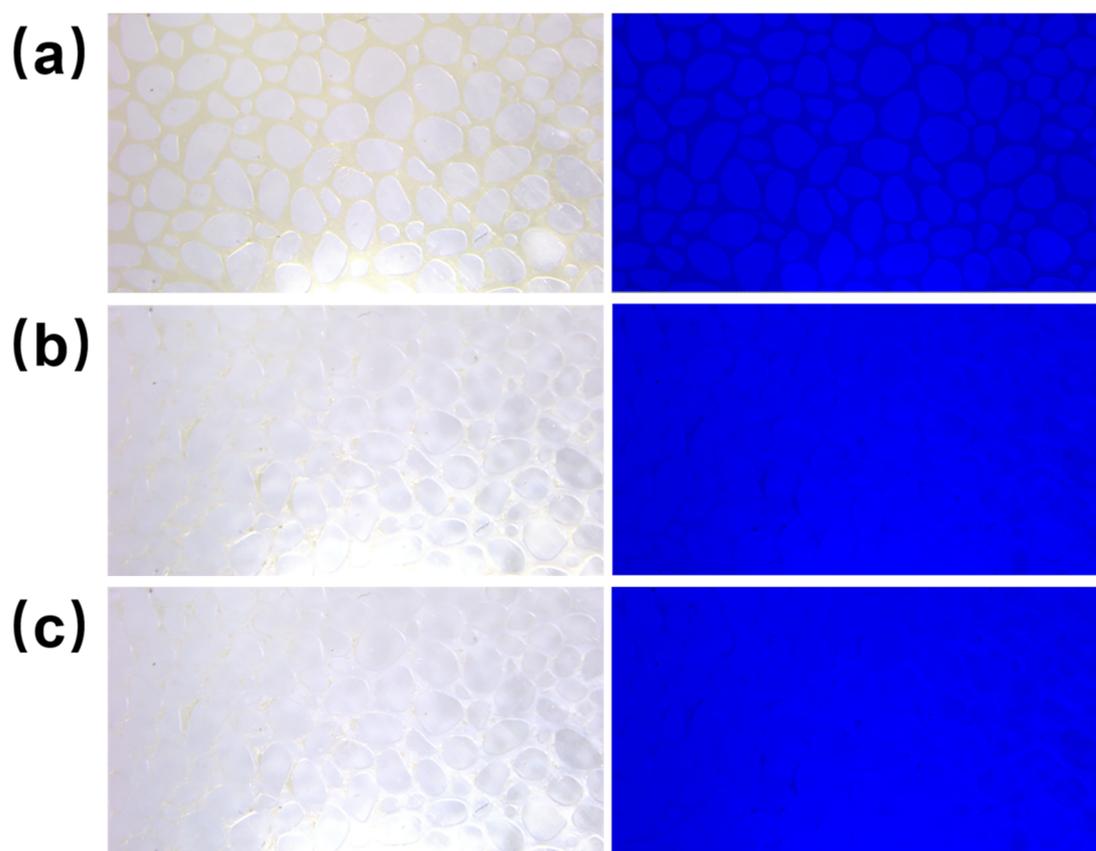
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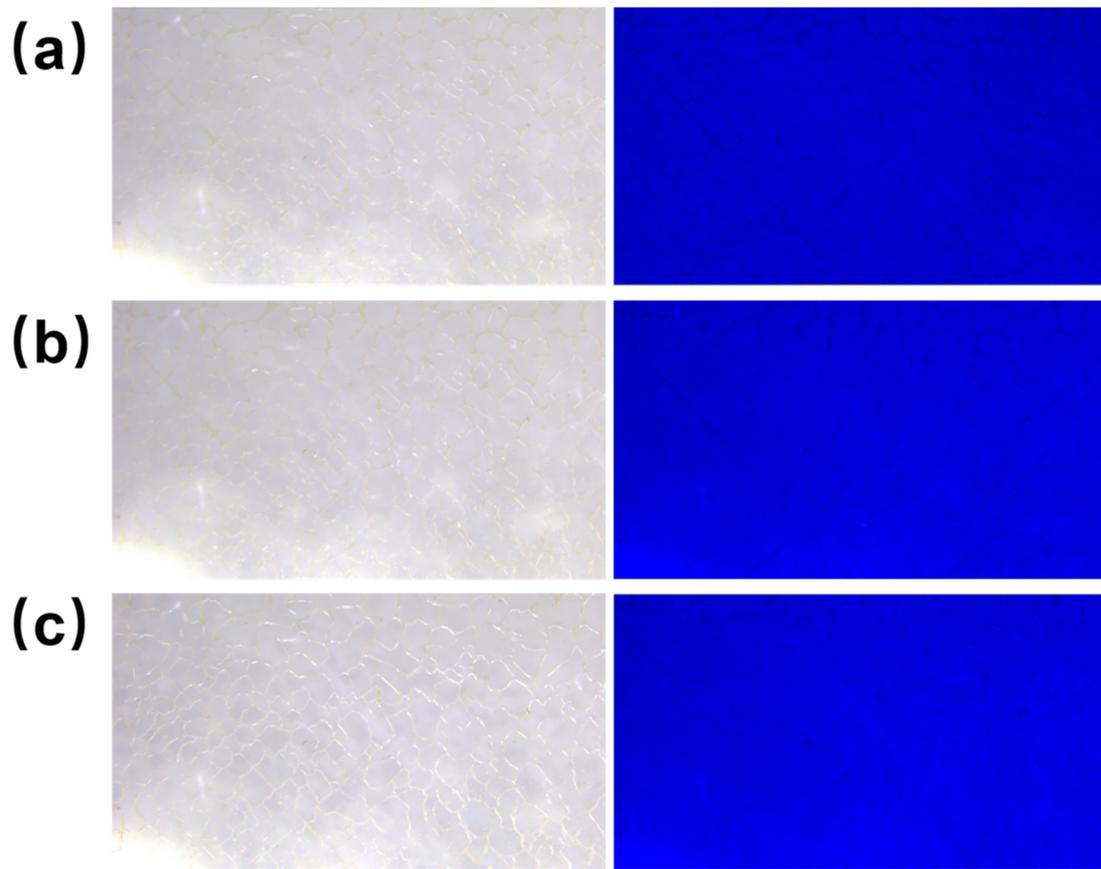
**Figure S1.** Images of 0.1 wt% acrylamide copolymer nanospheres dry powder dispersion at different temperatures for nanofluid spreading experiments: **(a)** 25°C, experimental initial plots; **(b)** 25°C, experimental 60 min effect plots; **(c)** 65°C, experimental initial plots; **(d)** 65°C, experimental 60 min effect plots.



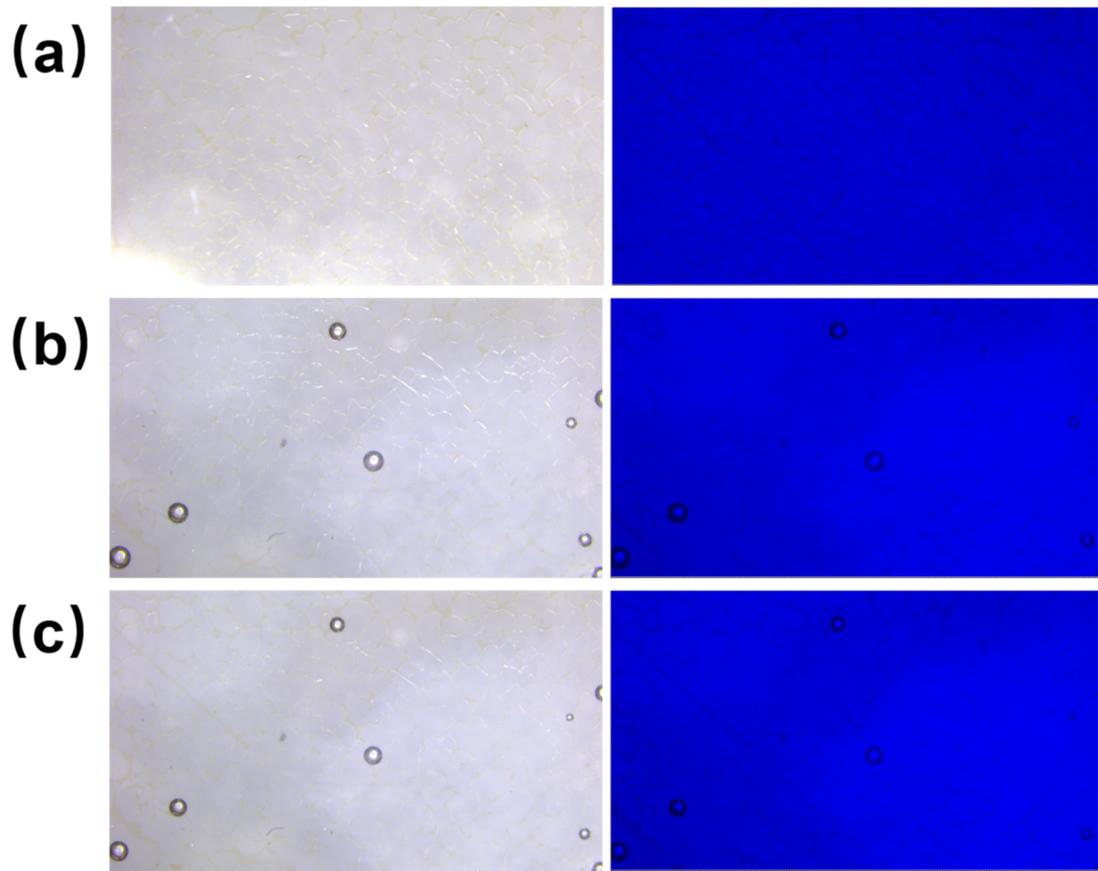
**Figure S2.** Images of 100 ppm copper quantum dot dispersion at different temperatures for nanofluid spreading experiments: **(a)** 25°C, experimental initial plots; **(b)** 25°C, experimental 60 min effect plots; **(c)** 65°C, experimental initial plots; **(d)** 65°C, experimental 60 min effect plots.



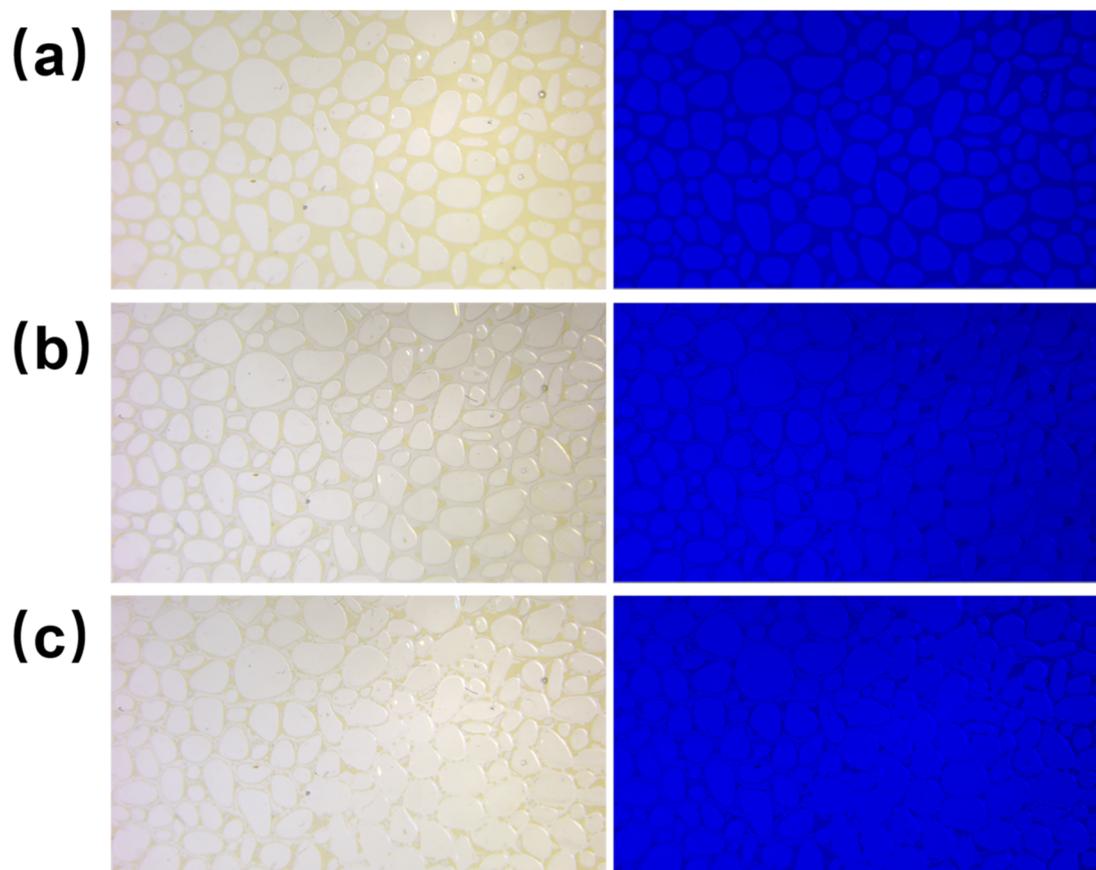
**Figure S3.** Real-time images and blue channel histograms of microchannel chip oil displacement experiments (large channel, 25°C, deionized water):  
(a) Original oil-filled image; (b) After injection of acrylamide copolymer nanosphere emulsion dispersion; (c) After injection of copper quantum dot dispersion.



**Figure S4.** Real-time images and blue channel histograms of microchannel chip oil displacement experiments (small channel, 25°C, deionized water): (a) Original oil-filled image; (b) After injection of acrylamide copolymer nanosphere emulsion dispersion; (c) After injection of copper quantum dot dispersion.



**Figure S5.** Real-time images and blue channel histograms of microchannel chip oil displacement experiments (small channel, 65°C, deionized water): (a) Original oil-filled image; (b) After injection of acrylamide copolymer nanosphere emulsion dispersion; (c) After injection of copper quantum dot dispersion.



**Figure S6.** Real-time images and blue channel histograms of microchannel chip oil displacement experiments (large channel, 25°C, injected water): **(a)** Original oil-filled image; **(b)** After injection of acrylamide copolymer nanosphere emulsion dispersion; **(c)** After injection of copper quantum dot dispersion.