

Triplet Fusion Upconversion Nanocapsule Synthesis

Tracy H. Schloemer^{1,2}, Samuel N. Sanders¹, Qi Zhou², Pournima Narayanan³, Manchen Hu², Mahesh K. Gangishetty¹, Daniel Anderson¹, Michael Seitz^{1,2}, Arynn O. Gallegos², R. Christopher Stokes¹, Daniel N. Congreve^{1,2}

¹Rowland Institute, Harvard University ²Department of Electrical Engineering, Stanford University ³Department of Chemistry, Stanford University

Corresponding Author

Daniel N. Congreve
congreve@stanford.edu

Citation

Schloemer, T.H., Sanders, S.N., Zhou, Q., Narayanan, P., Hu, M., Gangishetty, M.K., Anderson, D., Seitz, M., Gallegos, A.O., Stokes, R.C., Congreve, D.N. Triplet Fusion Upconversion Nanocapsule Synthesis. *J. Vis. Exp.* (187), e64374, doi:10.3791/64374 (2022).

Date Published

September 7, 2022

DOI

10.3791/64374

URL

jove.com/video/64374

Materials

Name	Company	Catalog Number	Comments
Chemicals			
(3-aminopropyl)triethoxysilane, anhydrous	Acros Organic/Fisher Scientific	AC430941000	
10K MPEG-Silane	Nanosoft Polymers	2526	
Oleic acid (99%)	Beantown Chemical	126125	
Pd (II) meso-tetraphenyl tetrabenzoporphine (PdTBTP)	Frontier Scientific	41217	
tetraethyl orthosilicate, anhydrous	Millipore Sigma	86578	
TIPS-Anthracene	Millipore Sigma	731439	
Representative Ultracentrifuge for Nanocapsule Purification			While a smaller centrifuge can be used, the ultracentrifuge is convenient for the 12-14 h centrifugation to isolate upconversion nanocapsule paste.
500 mL, Polycarbonate Bottle with Cap Assembly, 69 x 160 mm - 6Pk	Beckman-Coulter	355605	
Avanti J-26S XP High-Performance Centrifuge	Beckman-Coulter	Avanti J-26S XP	
JA-10 Fixed-Angle Aluminum Rotor- 6 x 500 mL; 10,000 rpm; 17,700 x g	Beckman-Coulter	369687	
Specialized Fabrication Equipment and Consumable Materials			
3M 03429NA 051131034297 Scotch Electrical Tape, 3/4-in by 66-ft, Black, 1-Roll, 3/4 Foot	Amazon		
40 mL scintillation vials (28 mm OD x 95 mm Height, 24-400 thread size)	Fisher Scientific	CG490006	Small-scale synthesis
500 mL Single Neck RBF, 24/40 Outer Joint	Chemglass	CG-1506-20	Large-scale synthesis
Egg-shaped stir bar for use in a 500 mL round bottom flask (6.35 mm diameter, 16 mm length)	Fisher Scientific	14-512-122	Large-scale synthesis

Glovebox	Mbraun	LabStar Pro	This is the glovebox used by the authors. However, as long as the oxygen can be maintained at levels below ~10 ppm, any model is acceptable.
Magnetic stir plate - inside of glovebox	Any brand		
Magnetic stir plate with temperature control (oil bath or heating blocks) - outside of glovebox	Any brand		
Octagon-shaped stir bar for use in a 40 mL scintillation vial (3 mm diameter, 12 mm length)	VWR	58947-140	Small-scale synthesis
Parafilm M Wrapping Film	Fisher Scientific	S37440	
Precision Seal rubber septa	Millipore Sigma	Z554103-10EA	Large-scale synthesis
Vitamix Blender	Vitamix.com	E310	Large-scale synthesis
Vortex Genie 2	Millipore Sigma	Z258415	Small-scale synthesis
Representative Characterization Instrumentation and Accessories			
Brookhaven Instruments 90Plus Nanoparticle Size Analyzer	Brookhaven Instruments		
M Series 635nm Laser 300-500mW	Dragon Lasers		Incident wavelength for upconversion photoluminescence characterization. The laser should only be used by trained researchers in a dedicated optics space with appropriate safety protocols. The laser should be focused using a lens to increase the incident power density.
P50-1-UV-VIS	Ocean Insight	P50-1-UV-VIS	Patch cord for QE Pro
QE Pro Spectrometer	Ocean Insight	QEPRO-VIS-NIR	Spectrometer for collecting upconversion photoluminescence.
Supra55VP Field Emission Scanning Electron Microscope (FESEM)	Zeiss		