

Supplementary Information

Bio-inspired nanoreactor based on miniemulsion system to create organic-inorganic hybrid nanoparticles and nanofilms

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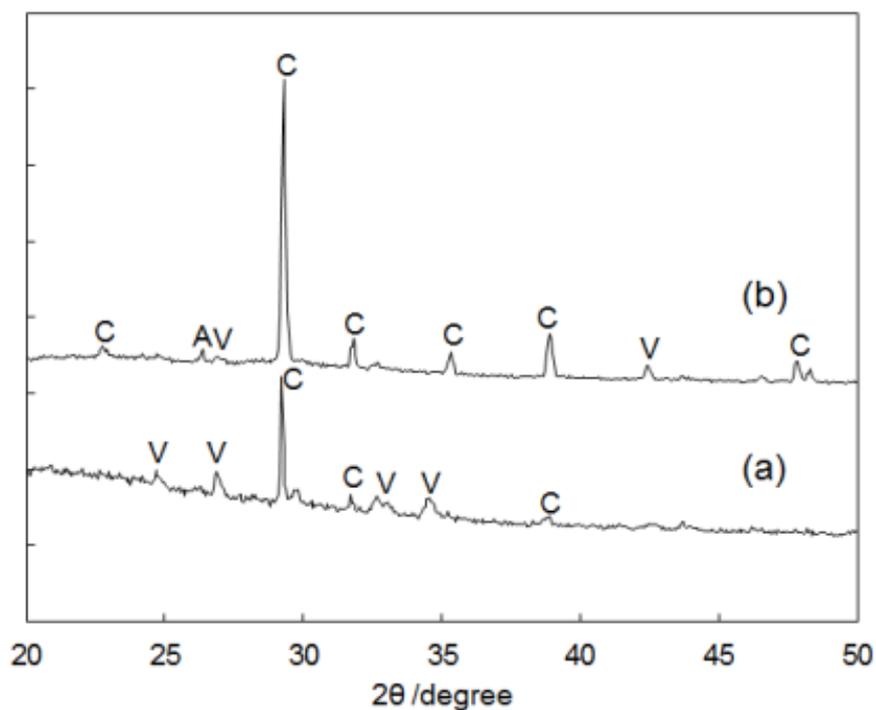


Figure S1: XRD spectra of nano-CaCO₃ produced in miniemulsion with (a) or without HEMA (b).

Symbol: C-calcite, A-aragonite, V- vaterite

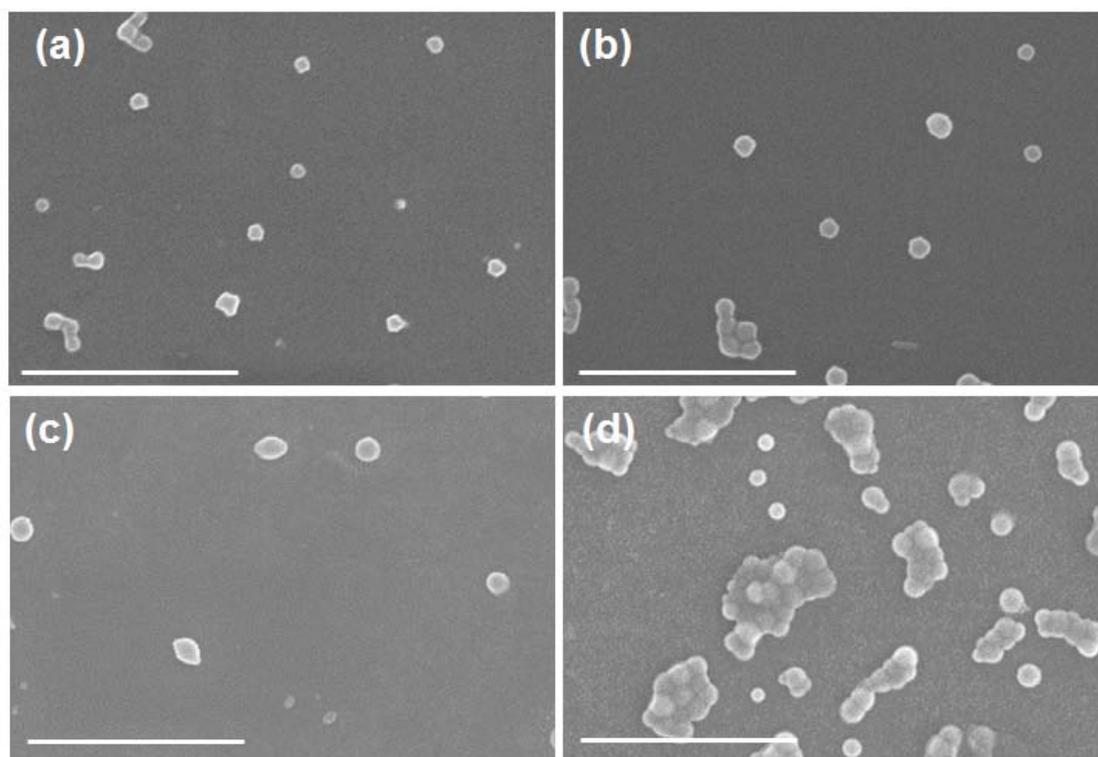


Figure S2. SEM images of hybrid nanoparticles produced at different conditions. (a) and (b); Preincubation was carried out at 25°C for 30 min (a) and 1d (b), followed by the polymerization at 65°C. Ion, monomer and AIBN were set at 0.4 M, 10 wt% and 60 mg, respectively. (c); Preincubation was carried out at 25°C for 30 min, followed by the polymerization at 65°C. Ion, monomer and AIBN added were set at 0.4 M, 10 wt% and 6 mg, respectively. (d); Preincubation was carried out at 25°C for 30 min, followed by the polymerization at 65°C. Ion, monomer and AIBN added were set at 2 M, 7 wt% and 60 mg, respectively. All scale bars are 1 μm.

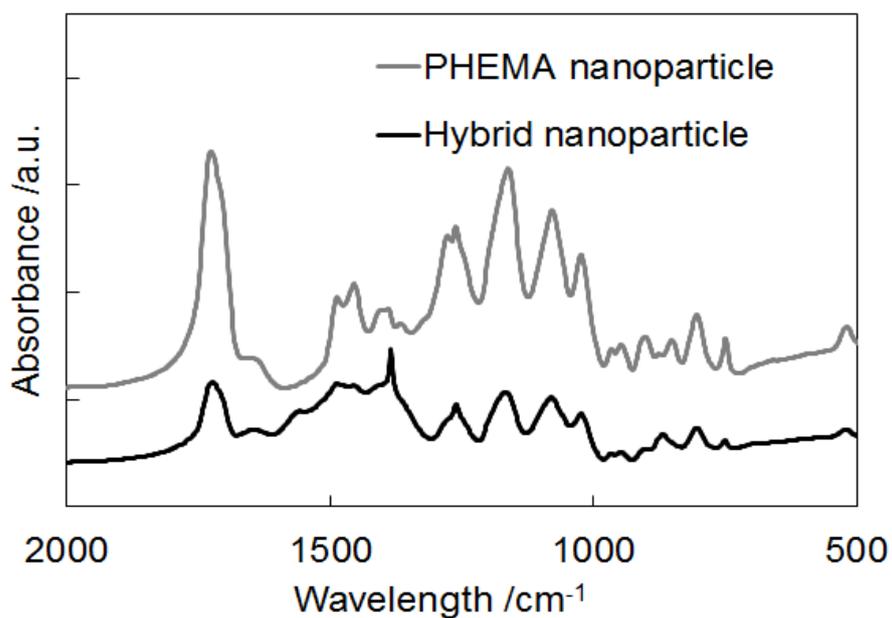


Figure S3: FT-IR spectra of a PHEMA nanoparticle and a hybrid nanoparticle (sample-3), which were obtained in the form of KBr discs.

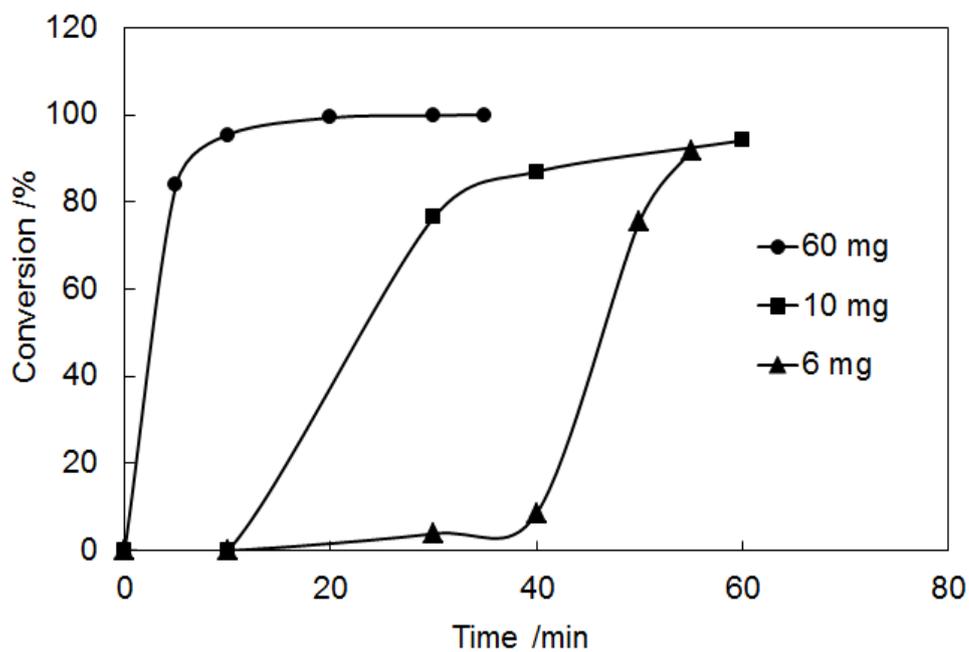


Fig. S4 Variation of monomer conversion in the miniemulsion polymerization of HEMA as a function of polymerization time. After preincubation at 25°C for 30 min, polymerization was initiated at 65°C by adding 60 mg, 10 mg and 6 mg of AIBN.

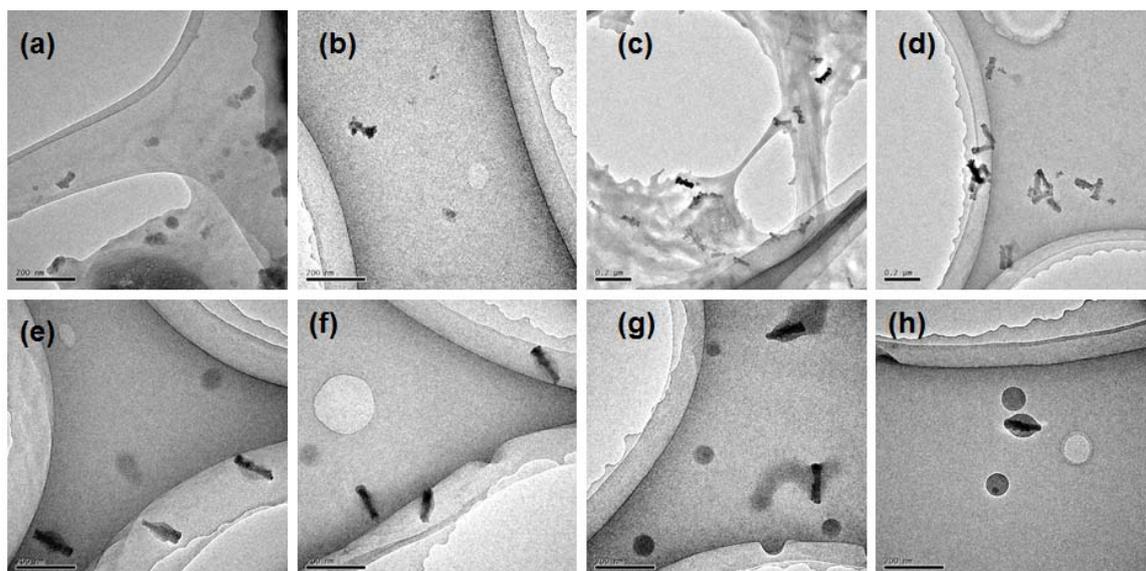


Fig. S5 TEM images of hybrid nanoparticles produced 10 min (a), 20 min (b), 30 min (c), 40 min (d), 50 min (e), 55 min (f), 60 min (g) and 4 h (h) after the addition of 6 mg of AIBN at 65°C. Ion and monomer concentrations were set at 0.4 M and 7 wt%, respectively. All scale bars are 200 nm.

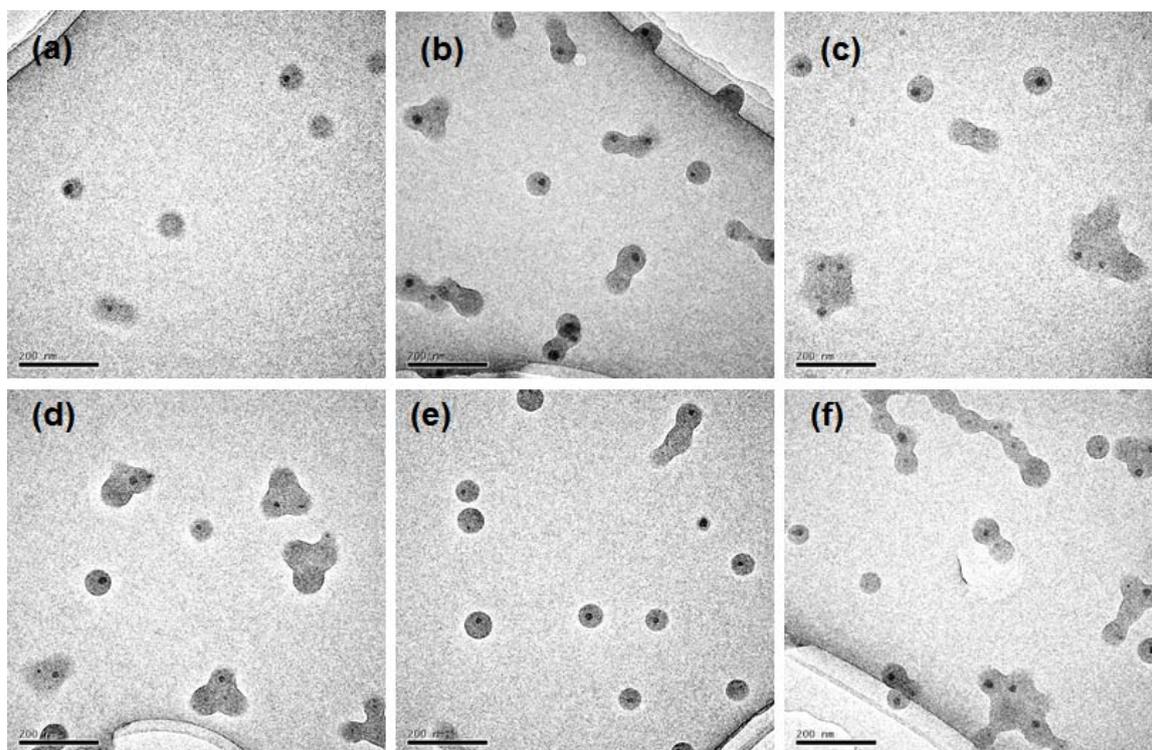


Fig. S6 TEM images of hybrid nanoparticles produced 5 min (a), 10 min (b), 20 min (c), 30 min (d), 40 min (e) and 4 h (f) after the addition of 60 mg of AIBN at 65°C. Ion and monomer concentrations were set at 0.4 M and 7 wt%, respectively. All scale bars are 200 nm.

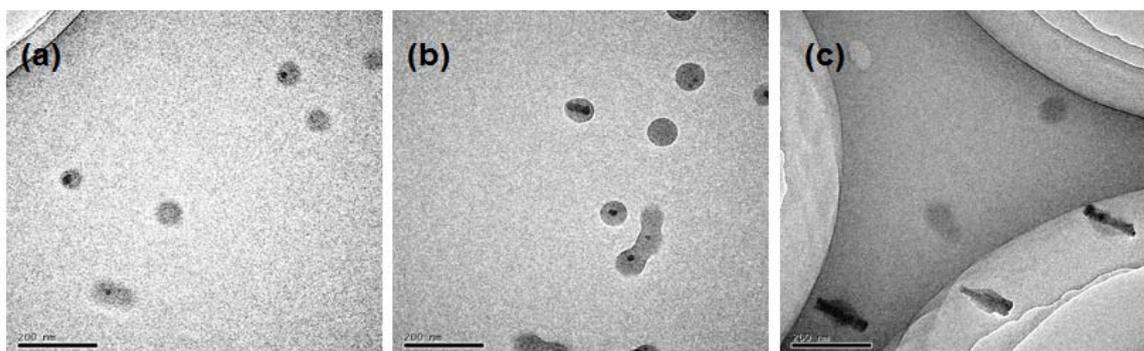


Fig. S7 TEM images of hybrid nanoparticles at the conversion of 70-80%, each of which was produced after the addition of 60 mg (a), 10 mg (b) or 6 mg (c) of AIBN at 65°C. Ion and monomer concentrations were set at 0.4 M and 7 wt%, respectively. All scale bars are 200 nm.

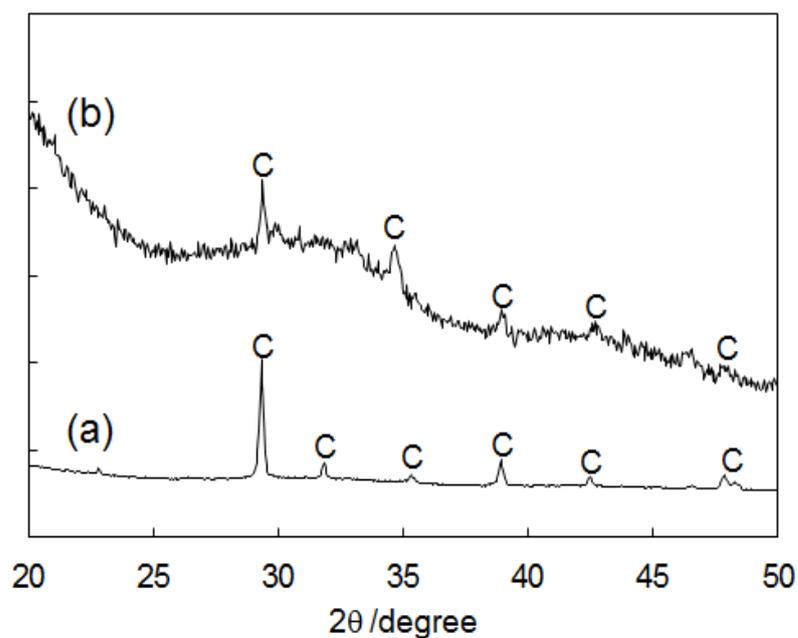


Figure S8: XRD spectra of hybrid nanoparticles produced at 2 M ions and 7wt% monomer. Precubation was carried out for 30 min (a) and 1 d (b), followed by polymerization at 65°C for 4 hr. Symbol: C-calcite.

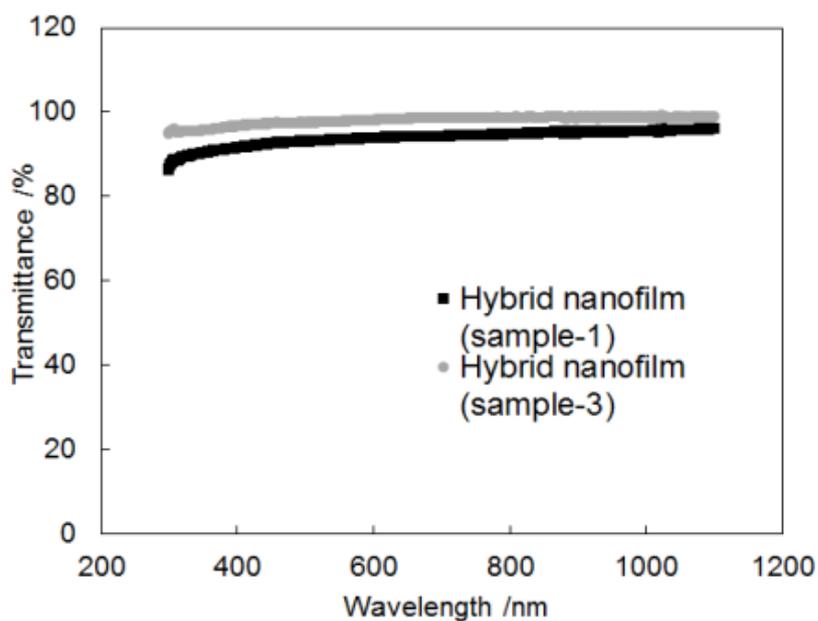


Figure S9: UV-VIS transmission spectra of the hybrid nanofilm composed of sample-1 or sample-3. Hybrid nanoparticles were spin-coated on the glass plate and were directly used for measurement of transmittance.

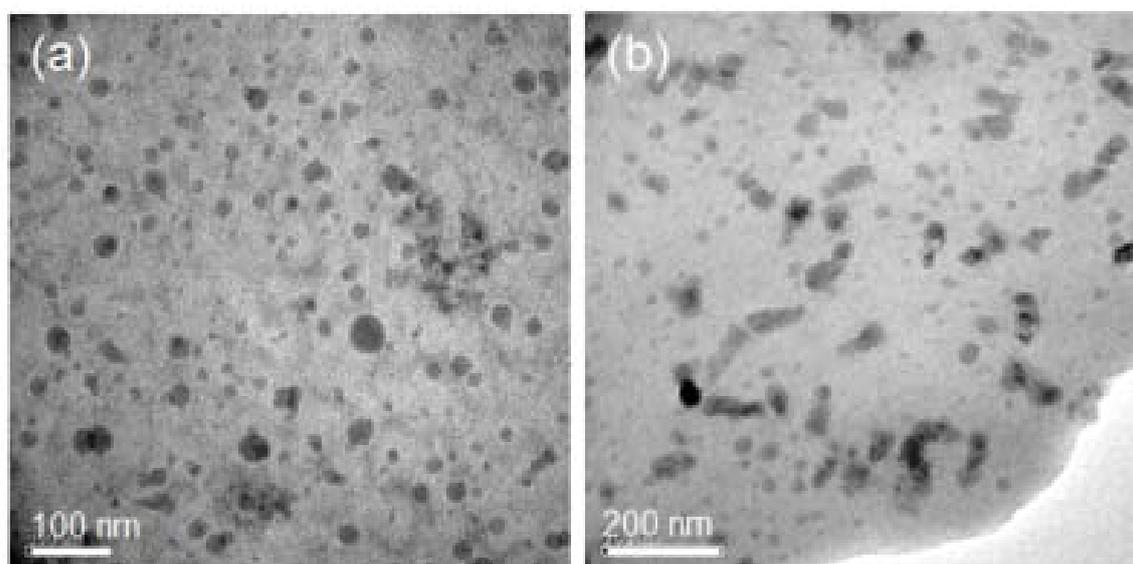


Figure S10: TEM images of hybrid nanofilms produced from sample-1. Heat treatment of hybrid nanofilms was conducted for 3 h at 65°C (a) and 120°C (b).