

Electronic Supplementary Information

1. ζ -potential of non-functionalized polymer particles.

Non-functionalized polymer particles were prepared from polystyrene (PS, M_n =12.4 kg/mol, M_w/M_n =1.04, Aldrich) and 1,2-polybutadiene (PB, M_n =13 kg/mol, M_w/M_n =1.04, Polymer Source) by using the same procedure as outlined in the main manuscript. Polymer particles prepared from non-functionalized polymers showed negative ζ -potentials due to hydroxide ions adsorbed on the polymer surface.

Table S1 Characterization of polymer particles

Polymer	M_n [kg · mol ⁻¹]	M_w/M_n	diameter [nm]	ζ -potential [mV]
polystyrene	12,400	1.06	561.8	- 55.5
1,2-poly butadiene	13,000	1.05	513.0	- 58.5

2. Preparation of composite particles from carboxy-terminated PB and positively charged Au NPs.

Positively charged Au NPs with primary amine groups (Au-NH₂ NPs) were synthesized according to a literature method.¹ A quantity of 2-amino ethanethiol hydrochloride (3.2 mg, Wako Pure Chemical Industries) was added to 40 mL of a 2.2 mM aqueous solution of HAuCl₄·4H₂O (Wako Pure Chemical Industries). The solution was stirred for 20 min, following which 5 μ L of 10 mM aqueous NaBH₄ (Wako Pure Chemical Industries) was added and the solution stirred for 3 h. The solution took on a brown coloration shortly after the NaBH₄ was added, and then turned deep red after 30 min. Transmission electron microscopy (TEM, H-7650, Hitachi, Japan) showed that the mean diameter of the Au-NH₂ NPs was about 25 nm. The ζ -potential of the Au-NH₂ NPs was +28.5 mV.

Negatively charged carboxy-terminated 1,2-polybutadiene (PB-COOH, M_n =2.2 kg/mol, M_w/M_n =1.11, Polymer Source) particles were prepared using the same procedure. The composite particles were prepared by mixing positively charged Au NPs and PB-COOH particles.

Figure S2 shows SEM and cross-sectional TEM images of the composite particles prepared from PB-COOH particles and positively charged Au NPs. It can be seen that the Au NPs were incorporated into the PB-COOH particles.

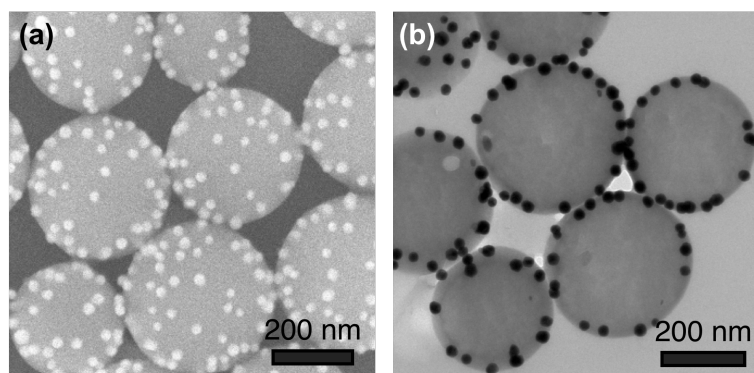


Figure S2 SEM image (a) and cross-sectional TEM image (b) of composite particles prepared from PB-COOH particles and positively charged Au NPs, respectively.

3. Au NPs coverage in the PB-NH₂-2 particles.

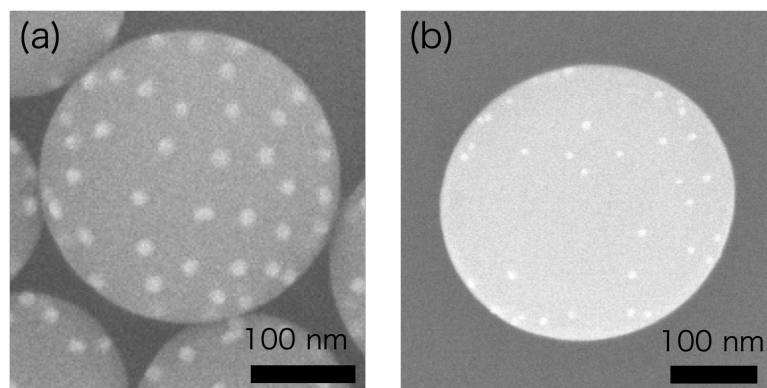


Figure S3 SEM images of the composite particles prepared from PB-NH₂-2 and Au NPs (20 nm) (a) and PB-NH₂-2 and Au NPs (10 nm), respectively.

Reference

[1] Niidome, T.; Nakashima, K.; Takahashi, H.; Niidome, Y. *Chem. Commu.* **2004**, *17*, 1978-1979.