Supporting Information

Colloidal Ink from Bumpy Colloidal Nanoparticles for Assembly of Ultrasmooth and Uniform Structural Colors

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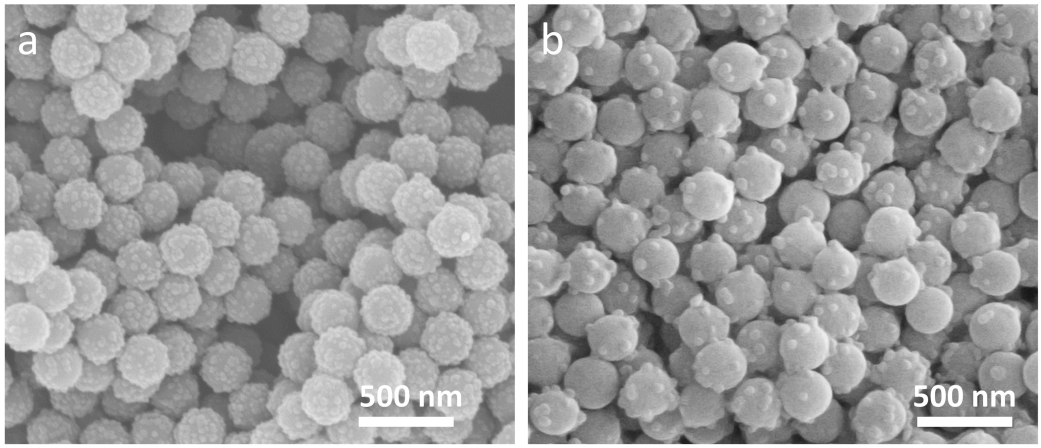

Figure S1. SEM image of (a) PPy@PS and (b) PPy@silica NPs. The same amount of pyrrole monomers is added into the aqueous solutions of the same amount of silica NPs and PS NPs, respectively.

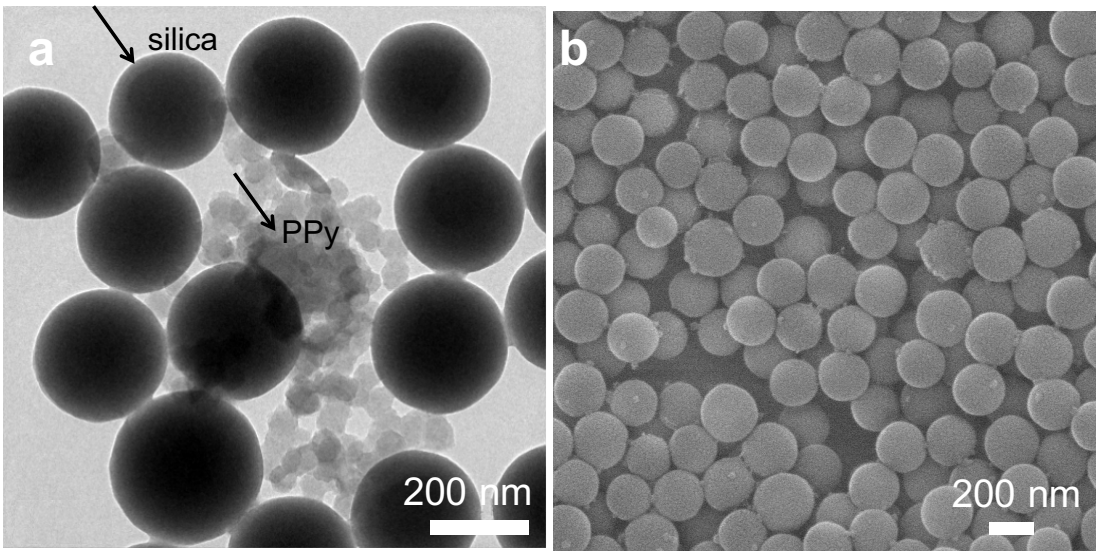

Figure S2. TEM image (a) and SEM image (b) of silica NPs modified by PPy without PVP.

It is important to determine the content of PPy black in the NPs. Fig S2 shows the TGA curves of silica-PVP and PPy@silica NPs. The weight ratio of PPy was calculated as 12 *wt*% according to $[m_{(product)}-m_{(silica)}]/m_{(silica)}\times 100\%$.

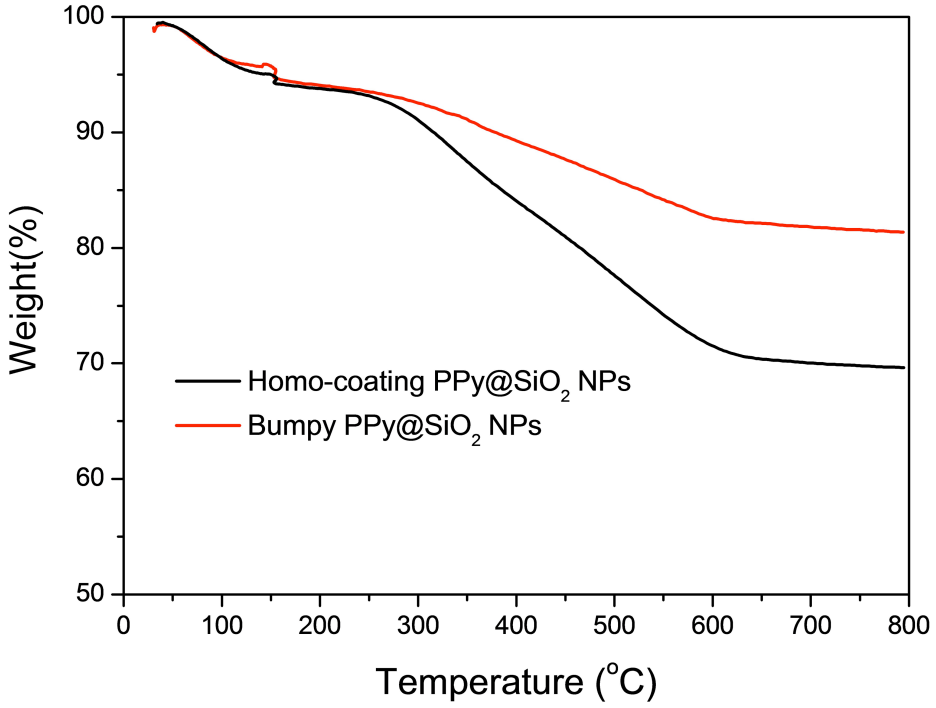

Figure S3. TGA curves of homo-coating PPy@SiO_2 NPs and bumpy PPy@SiO_2 NPs.

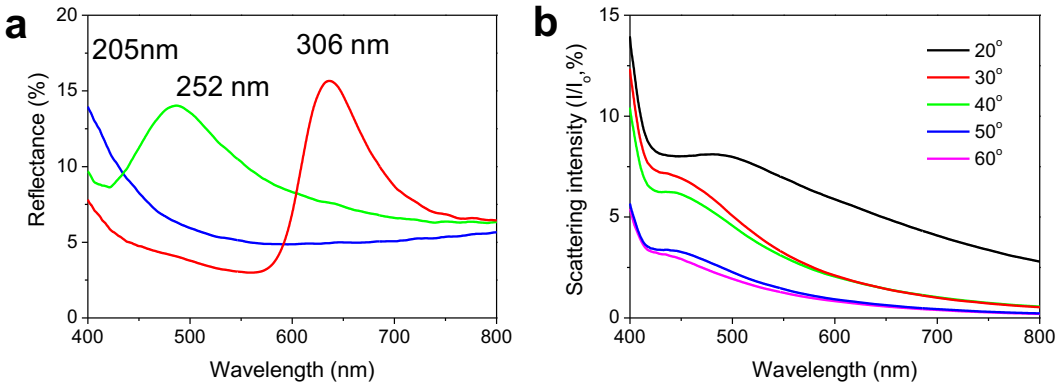

Figure S4. (a) Optical properties of the drop cast silica NP films with diameter of 205, 252, and 306 nm, respectively. The incident and detect angles are both 20°. (b) Backscattering spectra of drop cast silica NP films at different detection angles. The incident angle is 0°.

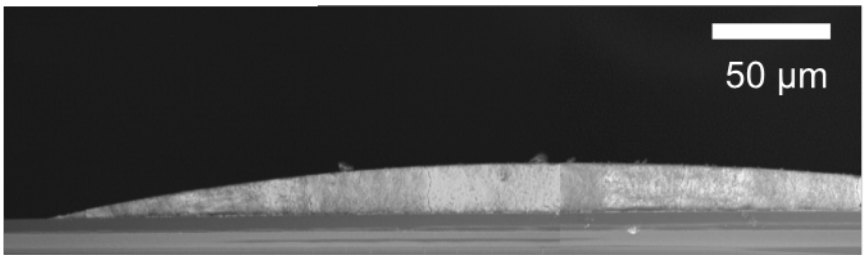

Figure S5. Cross-sectional SEM images of the NP droplet profiles from silica NPs.

It can be seen that the film assembled from pristine silica NPs has a finite curvature and thickness gradient from center to edge due to the coffee-ring formation.

Movies S1-S5

Movie S1: Video of the drying process of silica NPs dispersed in IPA in transmission mode. NP concentration: 5%. Magnification: 20×. Play speed: 4×.

Movie S2: Video of the drying process of silica NPs dispersed in water in reflection mode. NP concentration: 10 wt%. Magnification: 5×. Play speed: 8×.

Movie S3: Video of the drying process of bumpy PPy@silica NPs dispersed in IPA in transmission mode. NP concentration: 5 wt%. Magnification: 20×. Play speed: 4×.

Movie S4: Video of the drying process of bumpy PPy@silica NPs dispersed in water in reflection mode. NP concentration: 10 wt%. Magnification: 5×. Play speed: 8×.

Movie S5: Video of the drying process of bumpy PPy@silica NPs dispersed in water in reflection mode. NP concentration: 5 wt%. Magnification: 5×. Play speed: 1×.