Supporting Information

The synthesis of Poly(p-phenylenediamine) microstructures without oxidant and their effective adsorption of Lead ions

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The effects of UV intensity and exposure time on the morphology

To investigate the influence of the UV intensity on the morphology, two kinds of UV lamp with 40W UV and 10W UV, respectively, are used as the light source. As shown in Figure S1a and S1b, after irradiated by 40W UV lamp for 12 hours, the morphology of the sample without PVP show shorter and more coarse compared with that of 60W UV irradiation with 12h condition in Figure 2c and 2d. Following the deducing the intensity of UV lamp to 10W, the morphology of the sample would change into block shape, as shown in figure S2a and S2b. Figure S1c and S1d show the morphologies of the P*p*PD polymer under 40W UV irradiation after 12h irradiation with 0.1g of PVP and 0.2g of PDA in 10mL of H_2O condition, which is similar with the shuttle-rotary microstructures except for the rough surface compared with that of P*p*PD polymer under 60W UV irradiation in Figure 4a-c. Keeping the same amount of PVP, the morphology of P*p*PD polymer would change to almond-like structure when the intensity of UV lamp was decreased to 10W, as shown in Figure S2c and S2d. The morphologies of the P*p*PD polymer under 40W UV irradiation after 12h irradiation with 0.4g of PVP and 0.2g of PDA in 10mL of H_2O condition were shown in Figures S1e and S1f, which is similar with the broken sphere-like flower microstructures compared with that of P*p*PD polymer under 60W UV irradiation in Figure 4d-f. Furthermore, when the intensity of UV lamp changes to 10W at the same the ratio of PVP/PDA, the morphologies of the P*p*PD polymer also present the irregular micro-particles, as shown in Figure S2e and S2f. From the above experiments, we could find that the uniform microstructure could be formed only when the intensity of UV lamp is high enough. Otherwise, only the irregular microstructure such as broken sphere-like flower microstructures or block shape could be formed.

The influence of exposure time is further investigated to study this system. Figure S3a and S3b present the SEM images of the sample under 60W UV irradiation with 2h without PVP. It can be seen that the sample is composed of the rod shape with a diameter of 500nm-1μm besides a few broken fragments when the exposure

time is only two hours, as shown in Figure S4a and S4b. At an irradiation time of two hours under 60W UV irradiation with 0.1g of PVP and 0.2g of PDA in 10mL of H_2O, the morphologies of the sample shows the irregular block shape(Figure S3c and S3d). As depicted in Figure S4c and S4d, when prolonging the exposure time to 8h and keeping the same ratio of PVP/PDA, the morphologies of the sample is similar with that of the sample with 12h in Figure 4a-c except for the surface roughness. Figure S3e and S3f present the morphologies of the sample using 0.4g of PVP and 0.2g of PDA in 10mL of H_2O under 60W UV irradiation with 2h, which also present the irregular block shape. Furthermore, keeping the other condition unchanged except for prolonging the exposure time to 8h, we can find that the morphologies of the samples take on the sphere-like flower microstructure in Figure S4e and S4f, which is similar with that of the sample with 12 hours exposure time in Figure 4a-c except for the smaller diameter and the broader size distribution. The results based on the above experiments suggest that the exposure time plays the key role in the process of polymerization. Only after enough exposure time, the uniform microstructure such as sphere-like flower microstructures and shuttle-rotary microstructures could be formed

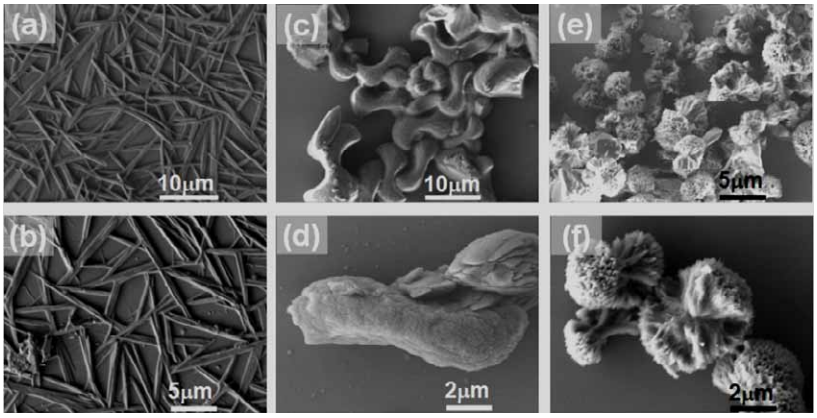

Figure S1. SEM images of P*p*PD samples synthesized by following method :a,b)no PVP; c,d,) 0.1g of PVP and 0.2g of PDA in 10mL of H_2O; e, f) 0.4g of PVP and 0.2g of PDA in 10mL of H_2O under 40W UV irradiation with 12h.

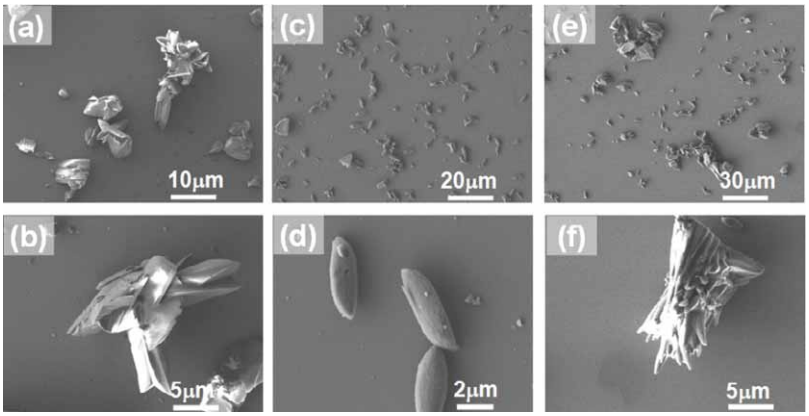

Figure S2. SEM images of P*p*PD samples synthesized by following method :a,b)no PVP; c,d) 0.1g of PVP and 0.2g of PDA in 10mL of H_2O; e,f) 0.4g of PVP and 0.2g of PDA in 10mL of H_2O under 10W UV irradiation with 12h.

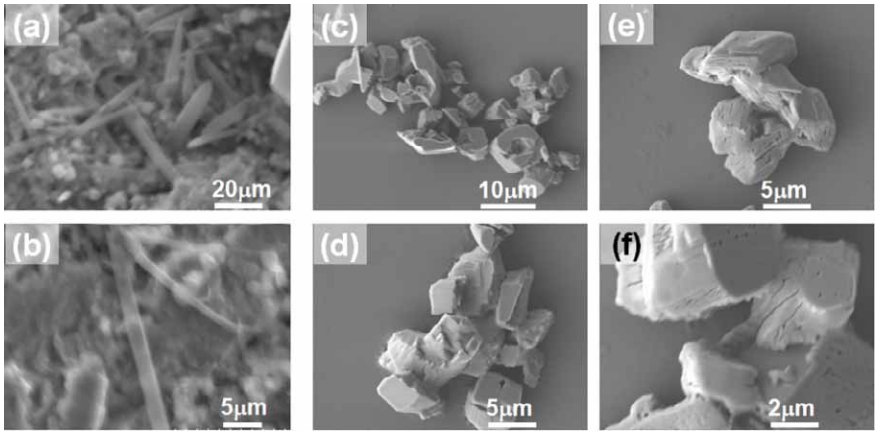

Figure S3. SEM images of P*p*PD samples synthesized by following method :a,b)no PVP; c,d) 0.1g of PVP and 0.2g of PDA in 10mL of H_2O; e,f) 0.4g of PVP and 0.2g of PDA in 10mL of H_2O under 60W UV irradiation with 2h.

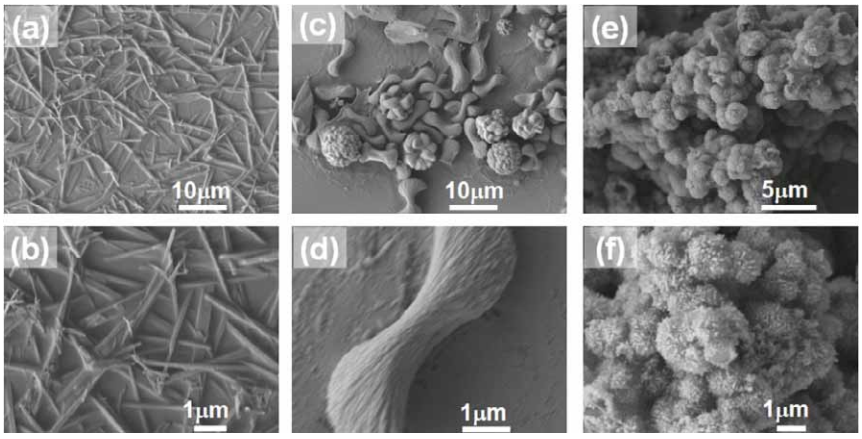

Figure S4. SEM images of P*p*PD samples synthesized by following method :a,b)no PVP; c,d) 0.1g of PVP and 0.2g of PDA in 10mL of H_2O; e,f) 0.4g of PVP and 0.2g of PDA in 10mL of H_2O under 60W UV irradiation with 8h.

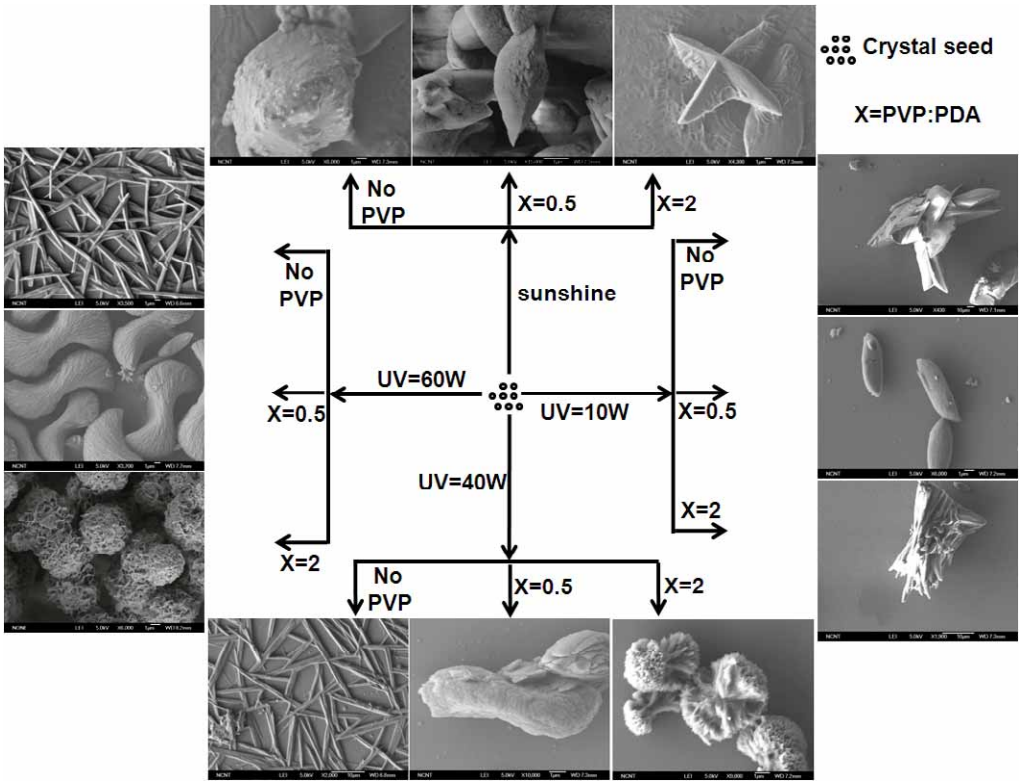

Figure S5. SEM images of the different conditions.