Supporting Information for "Facile synthesis of hollow carbon nanospheres by using microwave radiation"

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We can get the morphology of the SiO_2 NPs from SEM images (Figure S1) and Software ImageJ was used to obtain the particle size of silicon spheres (only the nearly circular particles in the figure were taken for statistics, and the particle size of irregular products was not counted). The average particle size and its standard deviation of each group with different parameters were calculated (Table S1). It can be seen that the average particle size increase with the decrease of ethanol/H_2O molar ratio, that is, the increase of water content of the system. With the decrease of ethanol/TEOS molar ratio, the content of TEOS increase, and the average size also increase. In the experiment whose particle size is controlled by the ratio of alcohol to water, except for irregular particles in the EH0 group without adding water (Figure S1a), the product morphology in other groups is more in line with circular particles. The reaction system without pure water added still contain water from ethanol and ammonia, that is to say, the reaction environment of EH0 group is not completely anhydrous. However, compared with other groups, it can be seen that the addition of pure water can make the particle shape closer to the circle, and the particle grows more evenly in all directions. At the same time, irregular particles were also observed in the ET5 group (Figure S1l). By comparison, it is found that the molar ratio of TEOS/H_2O in the EH0 group and the ET5 group is higher, indicating that the TEOS/H_2O molar ratio might determine whether the morphology of the products is even or not.

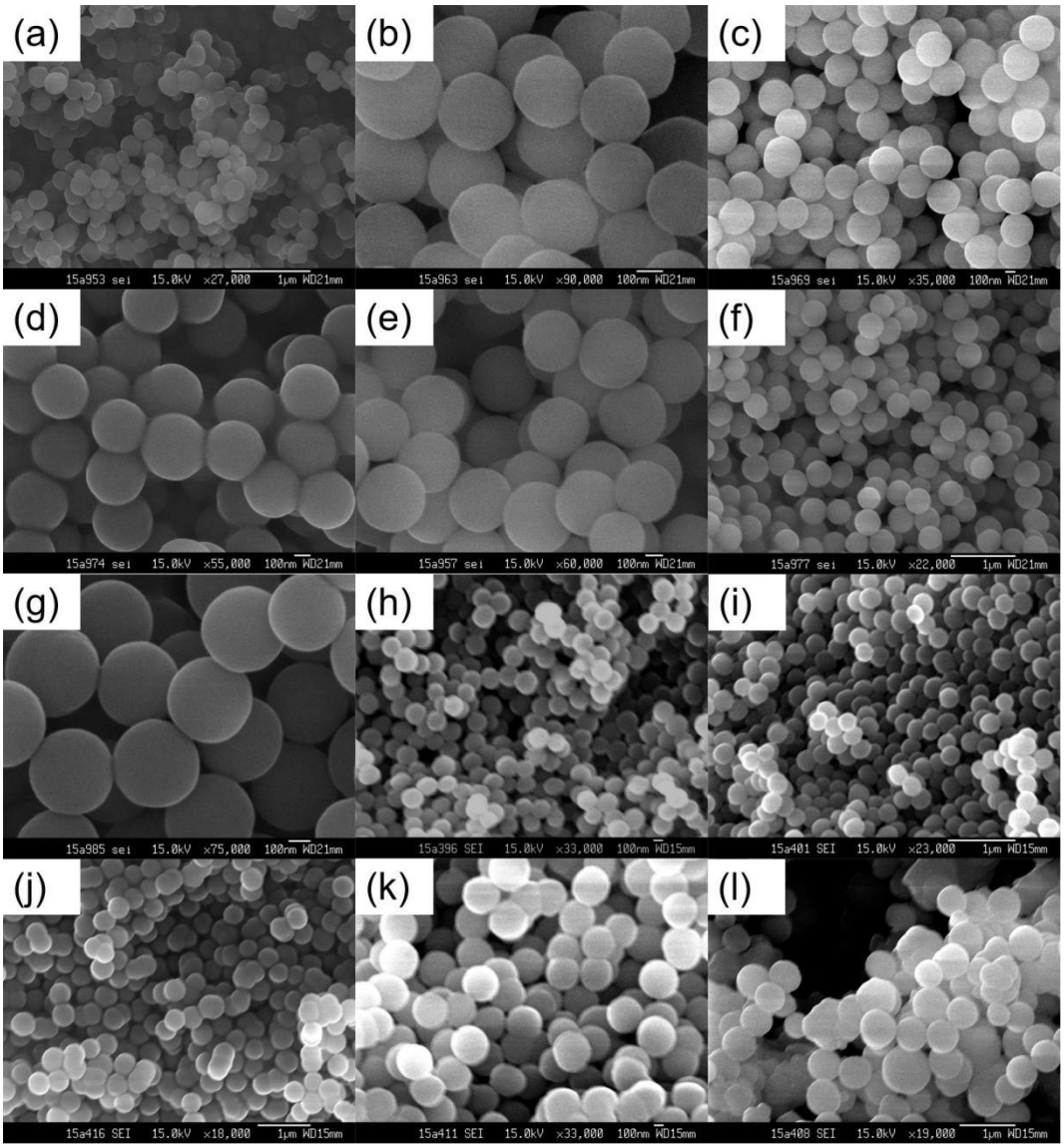

FIGURE S1: SEM images of EH0(a), EH1(b), EH2(c), EH3(d), EH4(e), EH5(f) and EH6(g) in the experiment controlled by alcohol/H_2O ratio and ET1(h), ET2(i), ET3(j), ET4(k) and ET5(l) in the experiment controlled by alcohol/TEOS ratio

TABLE S1: Mean particle size and standard deviation of silica spheres.

Samples		ethanol/H_2O molar ratio	Mean particle size/nm	standard deviation/nm
ethanol/H_2O controlled particle size group (EH group)	EH0	4.5	228	42
	EH1	3.49	289	20
	EH2	2.59	331	17
	EH3	2.09	361	22
	EH4	1.82	355	23
	EH5	1.63	375	25
	EH6	1.41	394	32
Samples		ethanol/TEOS molar ratio	Mean particle size/nm	standard deviation/nm
ethanol/TEOS controlled particle size group (ET group)	ET1	190.93	194	17
	ET2	76.37	270	21
	ET3	38.19	374	31
	ET4	31.82	353	49
	ET5	25.46	554	70

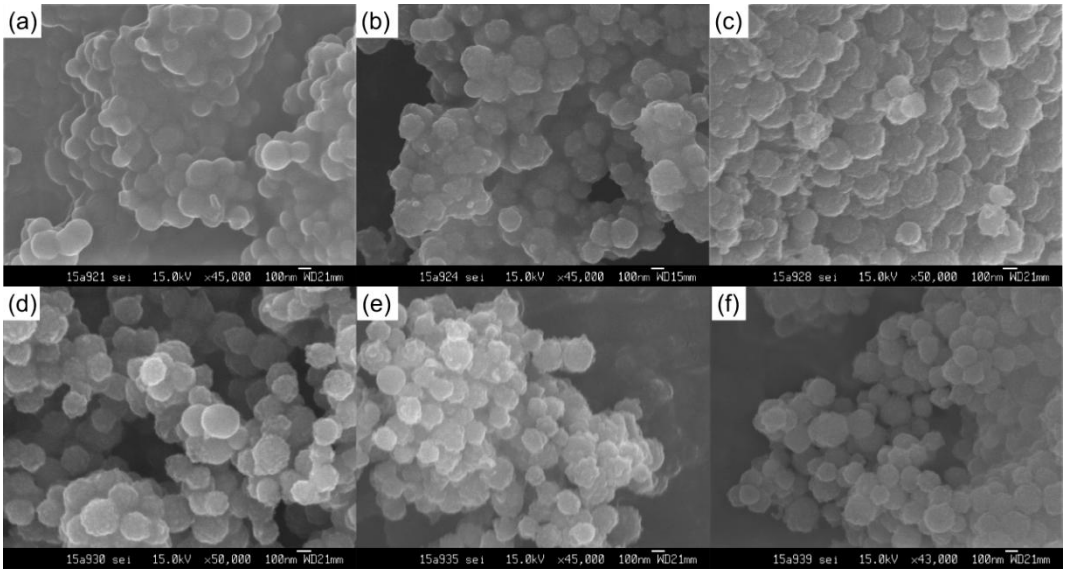

FIGURE S2: SEM images of SiO_2@PPy NPs at (a)0 wt%, (b)0.1 wt%, (c)0.2 wt%, (d)0.3 wt%, (e)0.4 wt% and (f)0.5 wt% concentration of CSA.

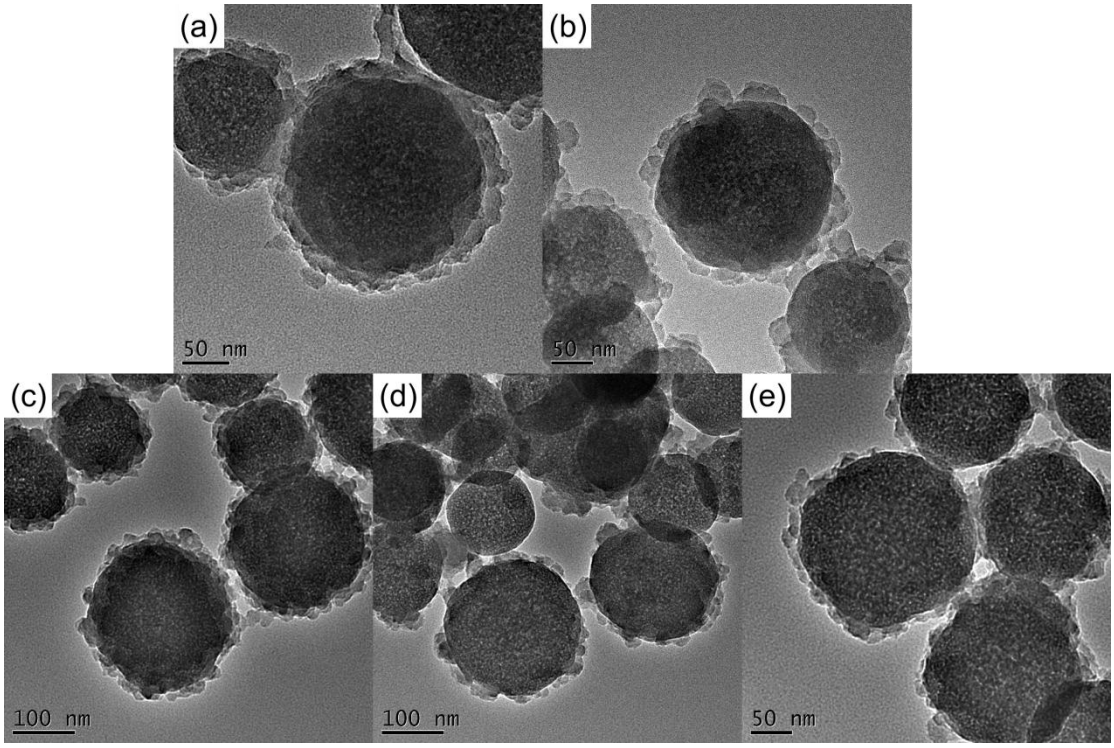

FIGURE S3: TEM images of SiO_2@PPy NPs at (a)0.1 wt%, (b)0.2 wt%, (c)0.3 wt%, (d)0.4 wt% and (e)0.5 wt% concentration of CSA.

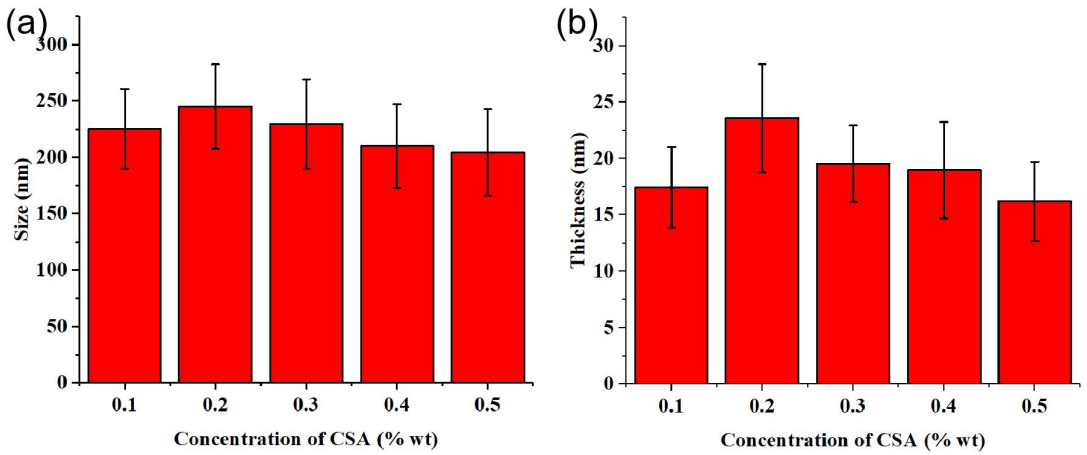

FIGURE S4: (a) Sizes and (b) thicknesses distributions of SiO_2@PPy NPs produced in different concentrations of CSA.

Description of the supporting information

The supporting information file contains the experimental details and results, including the scanning electron microscopy (SEM) images, tables containing the experimental parameters, and transmission electron microscopy (TEM) images, to support the discussions in the manuscript.