Supporting Information

One-step synthesis of poly(ethyleneglycol dimethacrylate)-microspheres- supported nano-Au catalyst in methanol-water solution under γ-ray radiation

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Keywords. Radiation induced precipitation polymerization, radiation reduction, gold nanoparticle, poly(ethyleneglycol dimethacrylate) microspheres, methanol-water solution

Part I. The UV-vis working curve for the determination of $[Fe(CN)_6^{3-}]$.

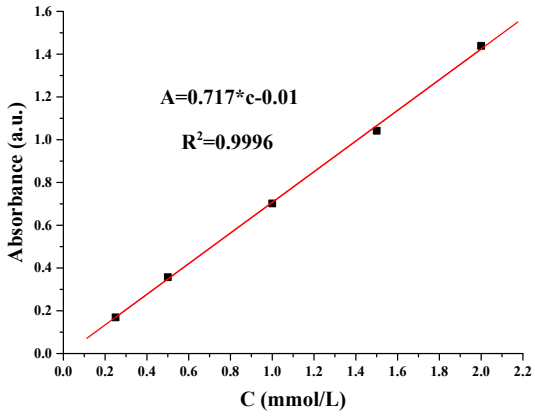

Fig.S1. The plot of UV-vis absorbance at 420 nm v.s. the concentration of $Fe(CN)_6^{3-}$ in aqueous solution.

Part II. The appearance of the products synthesized at different dose rate.

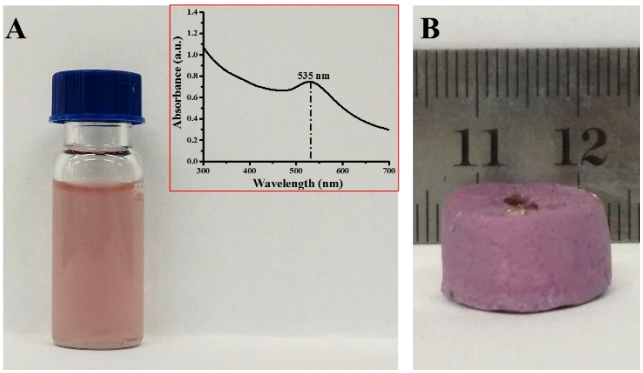

Figure S2. The digital photographs of the products after the γ-ray radiation on the methanol-water solution containing EGDMA, 4-VP and $HAuCl_4$ at dose rate of 20 Gy/min (A) and 110 Gy/min (B). Insert: The UV-vis spectrum of the dispersion in Figure S2A.

Part III. Thermal gravimetric analysis of PEGDMA@AuNP microspheres.

Thermal gravimetric analysis (TGA) of PEGDMA@AuNP microspheres was conducted on a TGAQ5000IR analyser in an air atmosphere at a heating rate of 10 ^{o}C/min with a temperature range from 25 to 800 ^{o}C, as shown in Figure S3. The remaining weight ratio at 800 ^{o}C indicated in Fig. S3 can be considered as the loading capacity of AuNP since all of the polymeric components will be burned away at that temperature.

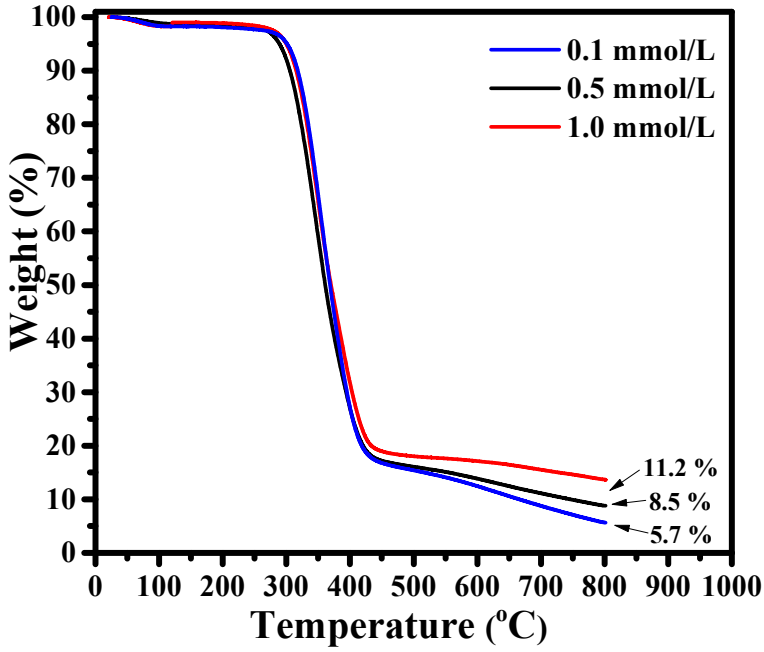

Figure S3. The TGA curves of PEGDMA@AuNP microspheres prepared at a dose rate of 55 Gy/min and different initial concentration of $HAuCl_4$.

Part IV. XPS analysis of PEGDMA@AuNP microspheres.

X-ray photoelectron spectra (XPS) of PEGDMA@AuNP microspheres prepared under different concentration of $HAuCl_4$ were carried out on Thermo ESCALAB 250 using monochromatic Al Kα radiation. The molar ratios of the elements are listed in Table S1, as well as the calculated weight content of Au.

Table S1. The molar ratios of the elements measured by XPS and the calculated weight content of Au

Sample ID	C (mol%)	N (mol%)	O (mol%)	Au (mol%)	Au (wt%)*
I#	73.3	8.9	17.0	0.75	10.2
II#	73.4	8.6	16.8	1.2	15.6
III#	73.2	8.4	16.6	1.8	22.4

#:Sample I, II, and III were prepared with a [$HAuCl_4$] of 0.1 mmol/L, 0.5 mmol/L, and 1 mmol/L, respectively.

*: the weight content of Au (wt%) is calculated according to the following equation:

$$Au(wt\%) = r_{Au} * M_{Au} / [r_{Au} * M_{Au} + r_C * M_C + r_N * M_N + r_O * M_O]$$

Where r_{Au}, r_C, r_N, and r_O are the molar ratio of element Au, C, N and O measured by XPS respectively. M_{Au}, M_C, M_N, and M_O are the atomic mass of the element Au, C, N and O, respectively.

Part V. XRD analysis and HRTEM of PEGDMA@AuNP microspheres after the catalytic experiments.

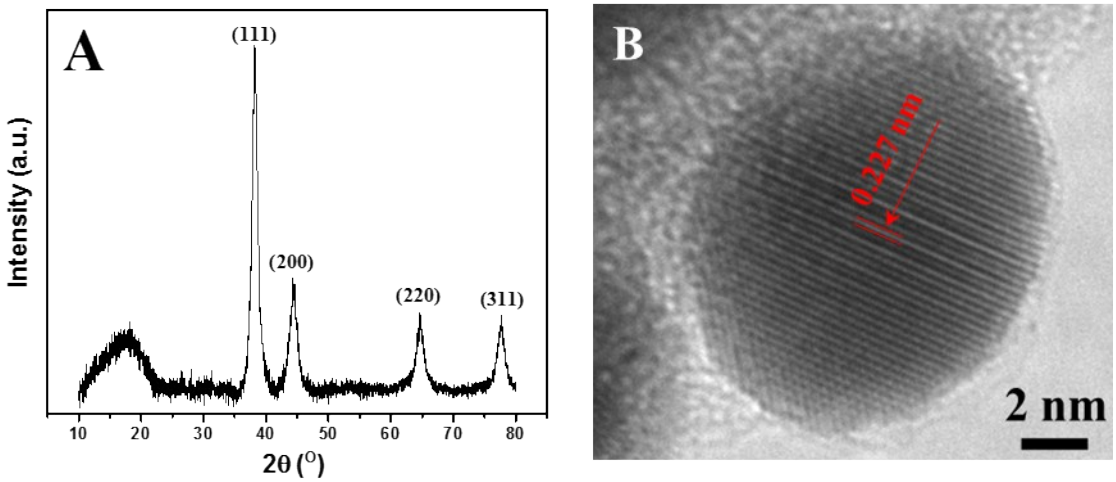

Figure S4. The XRD (A) and HRTEM (B) of PEGDMA@AuNP microspheres after the catalytic reactions.