

Supplementary Information for New Journal Chemistry

**Selective and Cycle Detection of Cr³⁺ Using Poly Methacrylic
Acid Monolayer Protected Gold Nanoparticles**

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Materials. Tetrahydrofuran, 1,4-dioxane, sodium borohydride, AIBN, bromobenzene, carbon disulfide were purchased from Tianjin Chemical Reagent Factory. Calcium hydride, benzophenone were purchased from Tianjin Chemical Reagent Institute. 2-chloropropyl methyl ester (99%) was purchased from Aldrich, gold chloride acid (>99.9%) was purchased from National Pharmaceutical Group Chemical Reagent corporation. While carbon disulfide, 2-chloropropyl methyl, bromobenzene were handled with vacuum distillation before use, THF prior to use in addition to water, AIBN was refined. RAFT agent 2 - (methoxy-based carbon carbonyl) - phenyl ethyl disulfide(MPED) was synthesized according to the literature procedure ^[1]. All glassware was thoroughly cleaned with freshly aqua regia (hydrochloric acid: nitric acid = 3:1) and rinsed thoroughly with distilled water prior to use.

Synthesis of the PMAA. Polytert-Butyl methacrylate (PtBMA) was firstly synthesized

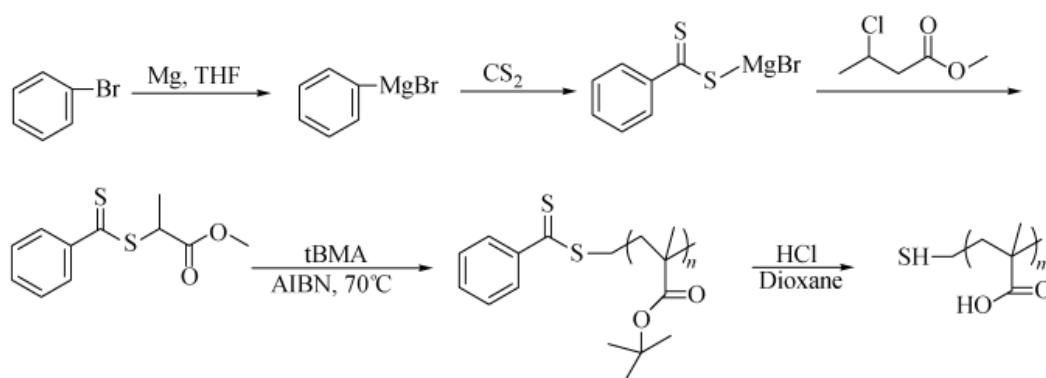
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by RAFT technique. The reaction mixture of tertiary-Butyl methacrylate (4g, 0.028mol), MPED (0.042g, 0.15mmol), AIBN(0.008g, 0.0487mmol) and tetrahydrofuran 4ml was degassed by three freeze-pump-thaw cycles before heating in a thermostated oil bath at 70°C for 24h. After the polymerization, the poly(t-BMA) was isolated by precipitating in a water-methanol(1:4) mixture.

PMAA was prepared by hydrolyzing the poly(t-BMA) under acidic condition. Polymer was dispersed in a 3ml HCL and 50ml 1,4-dioxane. The reaction mixture was heated at 90°C for 24h. Polymer was precipitated from 1,4-dioxane into ether. The synthesis procedures are illustrated in Scheme 1s.



Scheme 1s schematic representation for the synthesis of PMAA

Characterized polymer by ¹H-NMR and GPC. The GPC trace of poly(t-BMA) is shown in Fig 1s. From Figure 1, the molecular weight of poly(t-BMA) is 5240, and the PDI is 1.32. This can be used to calculate the PMAA molecular weight for 3120. Fig. 2s is the ¹HNMR spectrum of PtBMA and PMAA. After comparing to A and B, the disappearance of tert-butyl resonance at δ=1.50ppm, and the emerging of carboxyl at δ=12.4ppm, indicates the hydrolysis of tert-butyl has been completed.

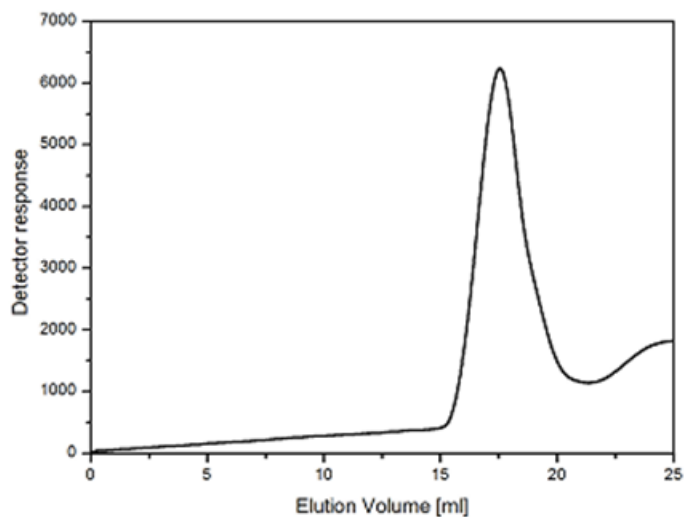


Fig. 1s GPC traces of poly (tBMA) in DMF at room temperature

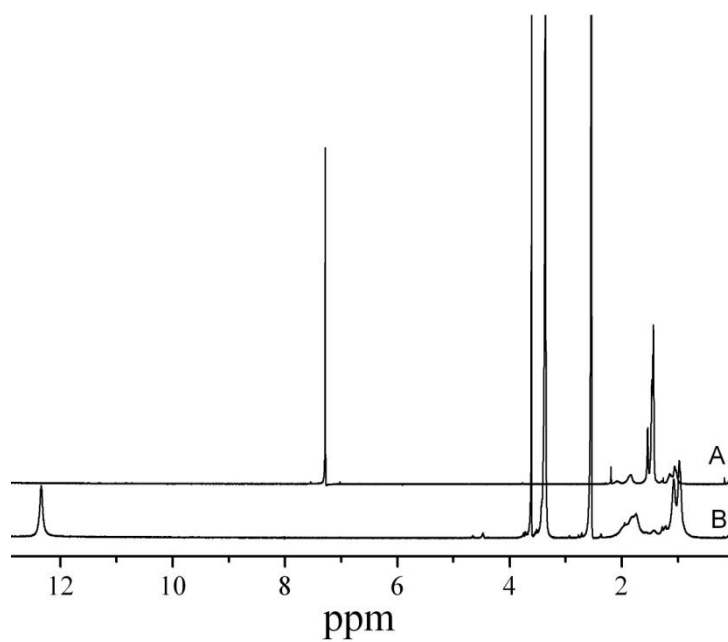


Fig. 2s (A) $^1\text{H-NMR}$ spectrum of PtBMA in CDCl_3 and (B) $^1\text{H-NMR}$ spectrum of PMAA in
DMSO

REFERENCES

- [1] S. Perrier, C. Barner-Kowollik, J. F. Quinn, P. Vana and T. P. Davis,
Macromolecules, 2002, **35**, 8330.