Selective Adsorption-deposition of Gold Nanoparticles onto Monodispersed Hydrothermal Carbon Spherules: a Reduction-deposition Coupled Mechanism

Fuchun Wang[a], Junmei Zhao[a]*, Menghao Zhu, Juezhi Yu[b], Yong-Sheng Hu[b], Huizhou Liu[a]*

[a] *Key Laboratory of Green Process and Engineering, Institute of Process Engineering, Chinese Academy of Sciences, Beijing 100190, China;*

[b] *Beijing National Laboratory for Condensed Matter Physics, Institute of Physics, Chinese Academy of Sciences, Beijing 100190, China.*

**E-mail: jmzhao@ipe.ac.cn*

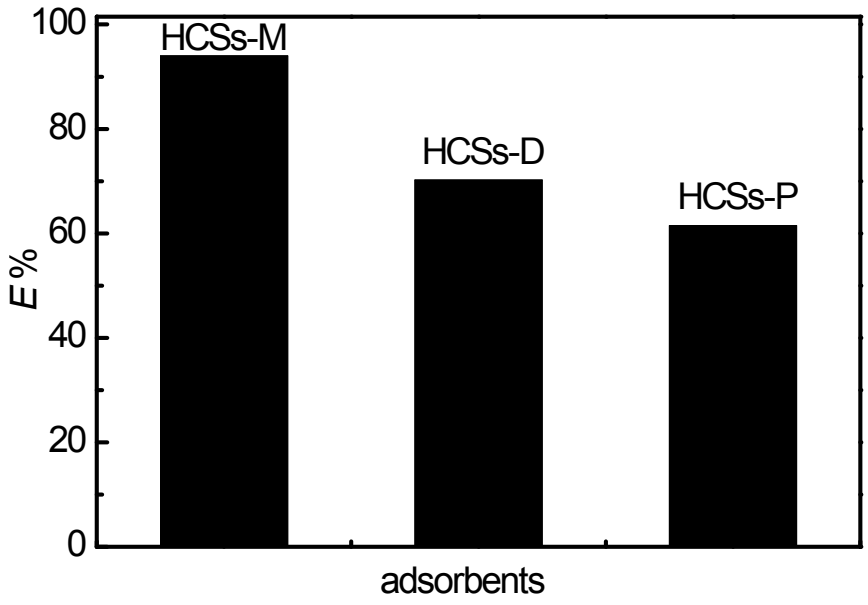

Fig. S1 The adsorption percentages of Au(III) by HCSs-M, HCSs-D and HCSs-P. t = 48 h, W = 0.01 g, C_i = 1.6 mM, V = 10 mL, T = 298.15 K, pH_e = *4.05*.

Table S1 Comparison of physical and chemical properties of HCSs-M with a representative activated carbon (AC)

	Elemental analysis (%)				surface area (m^2/g)	Volume of Pores (ml/g)	Ash (%)
	C	H	N	estimated O*			
HCSs-M	65.13	4.700	0	30.17	<15[26]	~0[17]	0.45
apricot-shell AC[12]	78.81	2.42	0.23	18.54	1387	0.95	0.2

* The content of oxygen (O) was estimated according to the difference method.

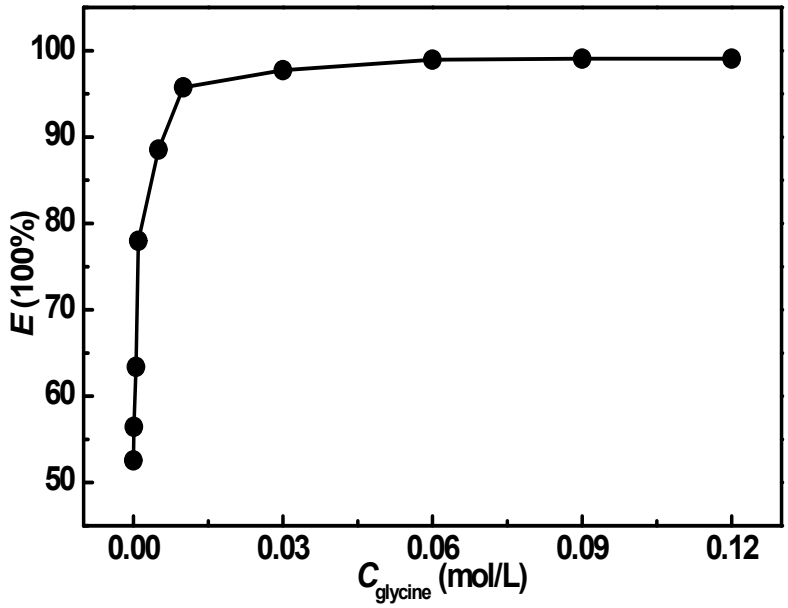

Fig. S2 The effect of the concentration of glycine on the adsorption of Au(III) by HCSs-M. t = 48 h, W = 0.01 g, V = 10 mL, C_i = 2 mM, T = 298.15 K, pH_e = 4.05.

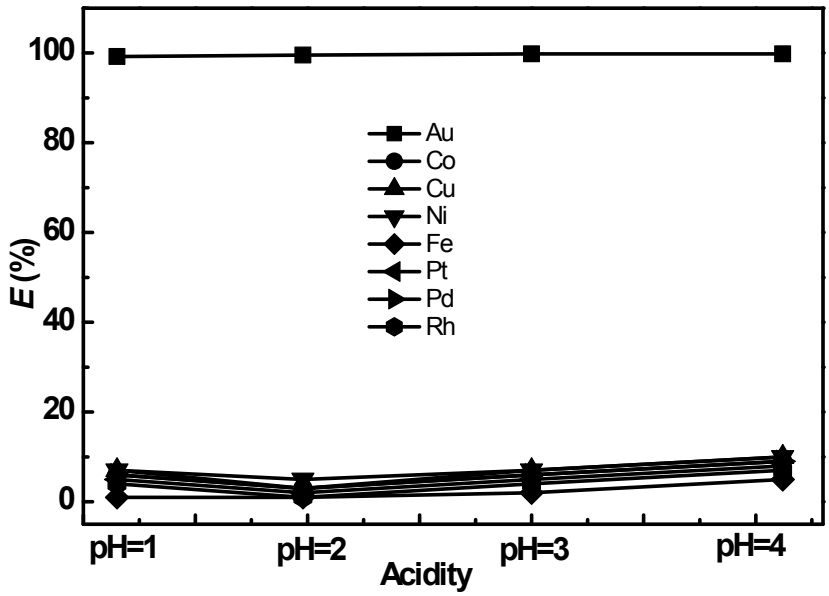

Fig. S3 Adsorption percentages of different metal ions with HCSs-M in the presence of 0.06 M glycine at pH 1 - 4. t = 48 h, W = 0.01 g, C_i = 0.1 mM, V = 10 mL, T = 298.15 K.

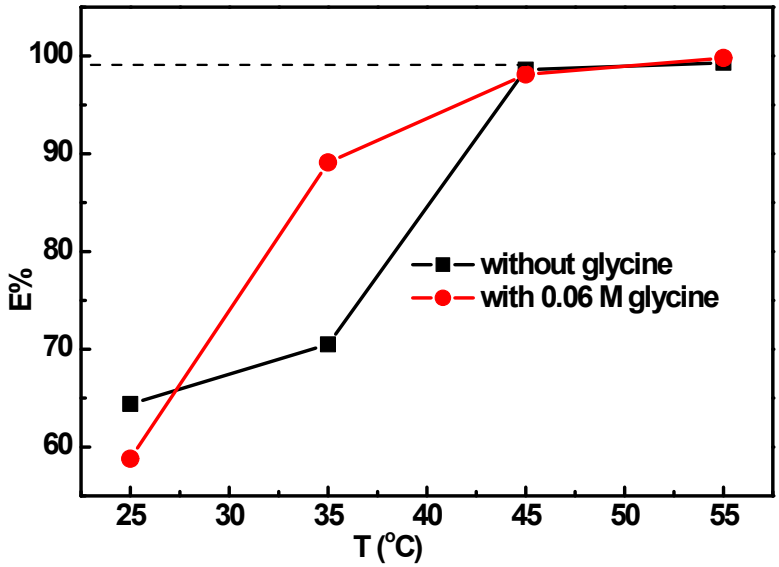

Fig. S4 Effect of temperature on the adsorption of Au(III) by HCSs-M. t = 48 h, V = 10 mL, W = 0.01 g, C_i = 2.91 and 21.9 mM without glycine and with 0.06 M glycine, respectively.

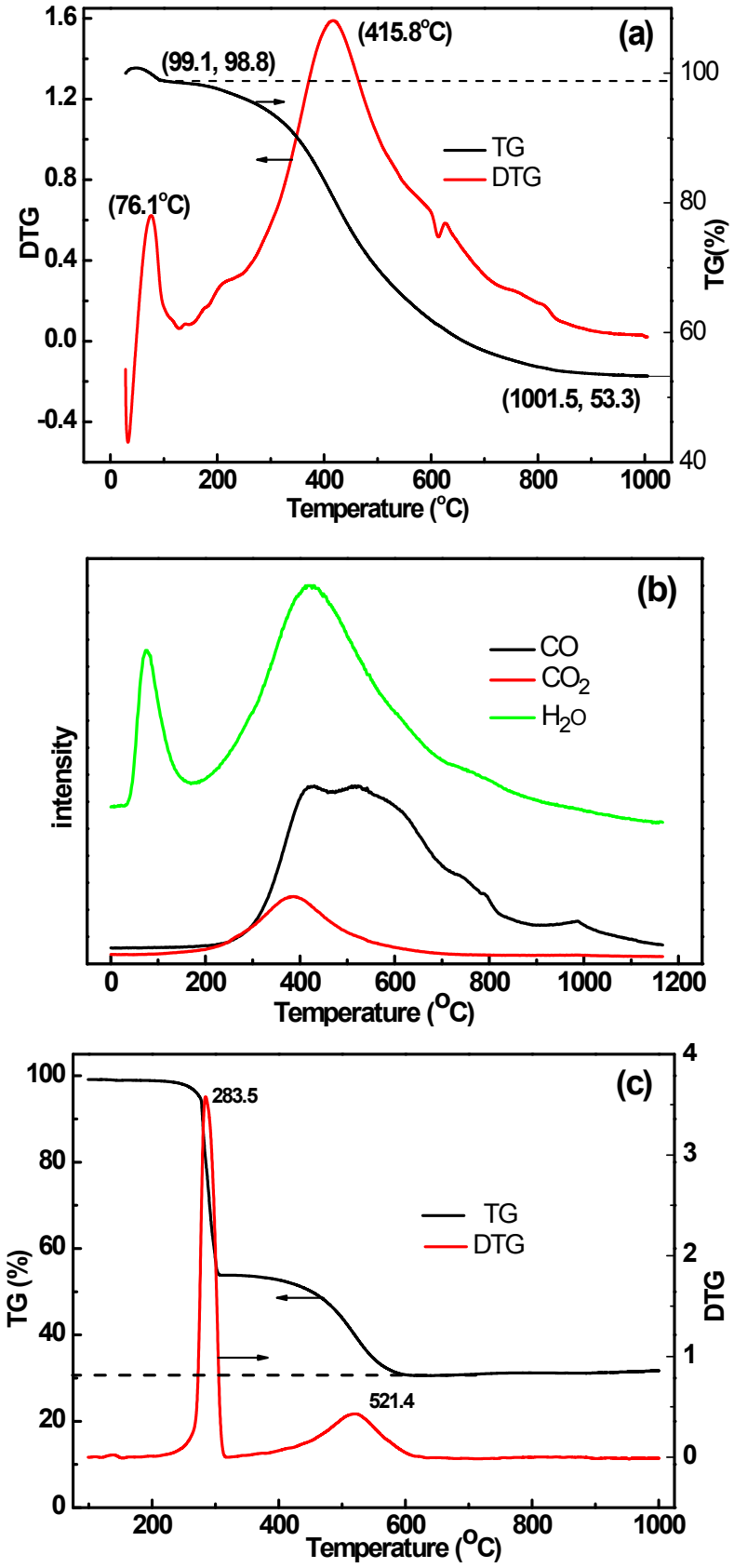

Fig. S5 TG-DTG (a) and TPD-MS (b) curves of HCSs-M in Ar at 10 °C/min, and TG-DTG curves of Au-loaded HCSs-M in air at 10 °C/min (c).

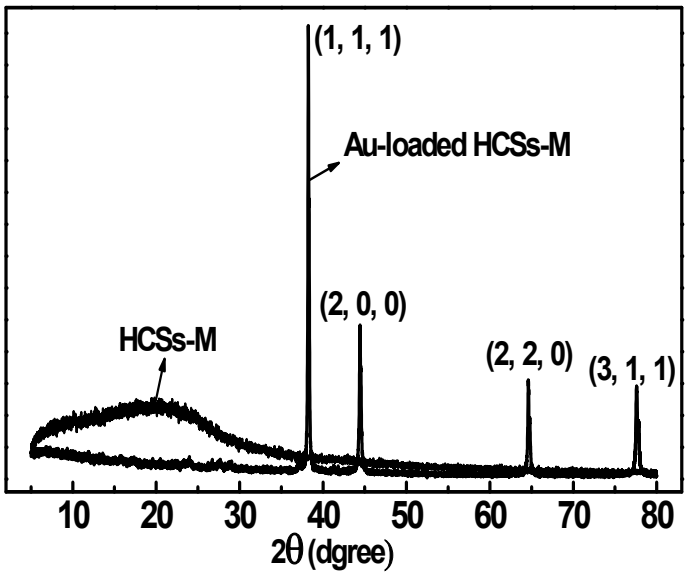

Fig. S6 XRD curves of as-synthesized HCSs-M and Au-loaded HCSs-M.

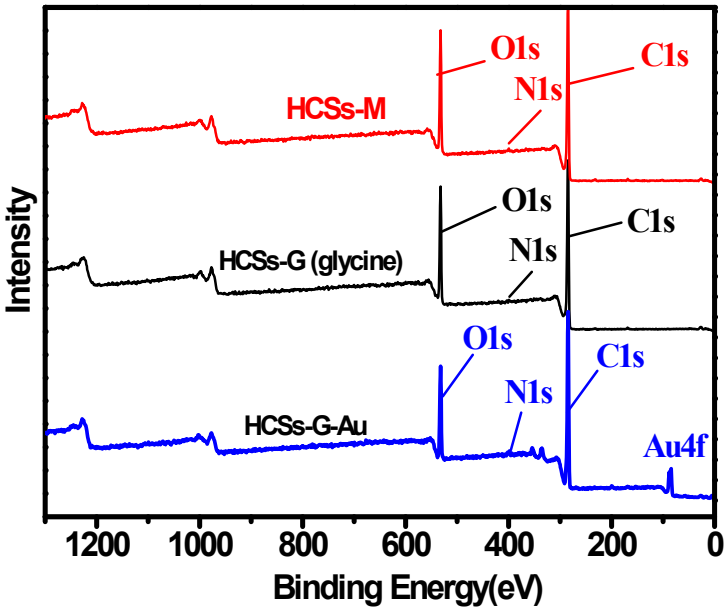

Fig. S7 XPS survey spectra of HCSs, HCSs-G (glycine) and HCSs-G-Au (in the presence of glycine)