Electronic Supplementary Material (ESI) for Environmental Science: Nano.

Importance of nano-sized molybdenum composite simply synthesized by a microwave oven in sorption enhancement of Au(III) from the aqueous phase

Chuanhao Yan[a], Xuefeng Yu[a], Jinlong Zhang[a], Jinglei He[a], Wenyi Jia[a], Jianlong Wang[b], Fuqiang Liu[c], Junfeng Liu[a], Xilong Wang[a, *]

[a] Laboratory for Earth Surface Processes, College of Urban and Environmental Sciences, Peking University, Beijing 100871, China

[b] College of Food Science and Engineering, Northwest A & F University, Yangling 712100, China

[c] State Key Laboratory of Pollution Control and Resource Reuse, School of the Environment, Nanjing University, Nanjing 210023, China

Corresponding author. Email address: xilong@pku.edu.cn (X. Wang)

Supplementary information

Details for calculating the composition of each component in MoCOM

Base on the XPS spectra of MoCOM (Fig. 3 a-e), We first identified the main components of MoCOM was MoS_2, MoO_3, and activated carbon (AC). Considering the relative atomic mass (A_r) of Mo, S, and O, we can list the mathematical equations below:

$$W(Mo) = W(MoS_2) \times \frac{A_r(Mo)}{A_r(Mo) + 2 \times A_r(S)} + W(MoO_3) \times \frac{A_r(Mo)}{A_r(Mo) + 3 \times A_r(O)} \qquad (S1)$$

$$W(S) = W(MoS_2) \times \frac{2 \times A_r(S)}{A_r(Mo) + 2 \times A_r(S)} \#(S2)$$

$$W(O+H) = W(MoO_3) \times \frac{A_r(Mo)}{A_r(Mo) + 3 \times A_r(O)} + W(O+H\ in\ AC) \#(S3)$$

$$W(AC) = W(MoO_3) + W(O+H\ in\ AC) + W(C) + W(N) \#(S4)$$

where W (w/w, %) represents the mass fraction of a specific component or element as indicated in the parenthese in MoCOM. There are four unknown terms ($W(MoS_2)$, $W(MoO_3)$, W(AC), and W(O + H in AC)) and four equations. By solving the above equations, we can calculate the composition of MoS_2,

MoO_3, and activated carbon in MoCOM, as shown in Fig. 3 f.

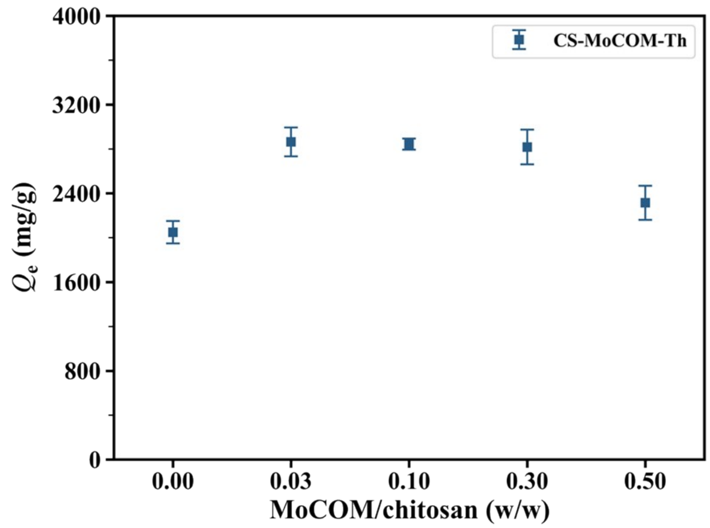

Fig. S1. The relationship between the mass ratio of MoCOM to chitosan and Q_e.

Table S1. Langmuir, Freundlich, and Temkin model fitting results for sorption isotherms of Au(III) by CS-Th and CS-MoCOM-Th.

Sorption isotherm models	Parameters	Nanofiber mats	
		CS-Th	CS-MoCOM-Th
Langmuir model	K_L (mL/mg)	17.5	21.5
	Q_m (mg/g)	2960	4090
	R^2	0.979	0.987
Freundlich model	n	2.63	2.55
	K_F ((mg/g)/(mg/L)$^{1/n}$)	3320	4760
	R^2	0.895	0.923
Temkin model	K_T (10^5 mL/mg)	0.776	1.11
	B_T	218	295
	R^2	0.919	0.920

Table S2. Pseudo-first-order, pseudo-second-order, and Elovich model fitting results for sorption kinetics of Au(III) by CS-Th and CS-MoCOM-Th.

Sorption kinetics models	Parameters	Nanofiber mats	
		CS-Th	CS-MoCOM-Th
Pseudo-first-order model	k_1 (10^{-3} mg/(min·g))	3.54	5.58
	Q_e (mg/g)	1330	1340
	R^2	0.935	0.682
Pseudo-second-order model	k_2 (10^{-6} g/(min·mg))	6.16	7.57
	Q_e (mg/g)	2150	2920
	R^2	0.996	0.998
Elovich model	α (mg/min·g)	149	501
	β (10^{-3} g/mg)	3.10	2.51
	R^2	0.950	0.956

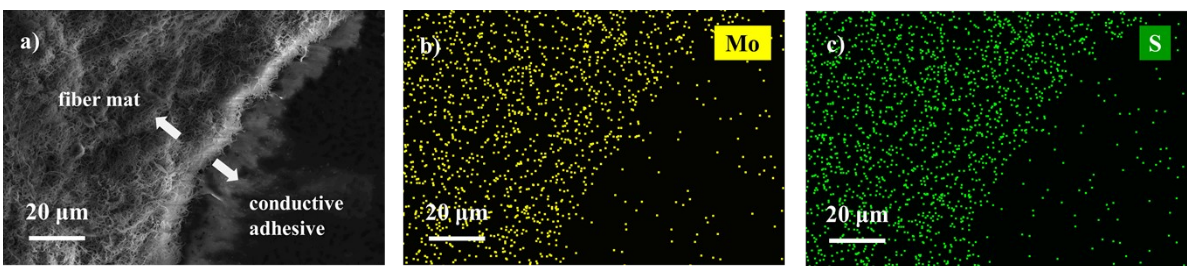

Fig. S2. SEM image (a) and EDS mapping (b and c) for CS-MoCOM-Th.

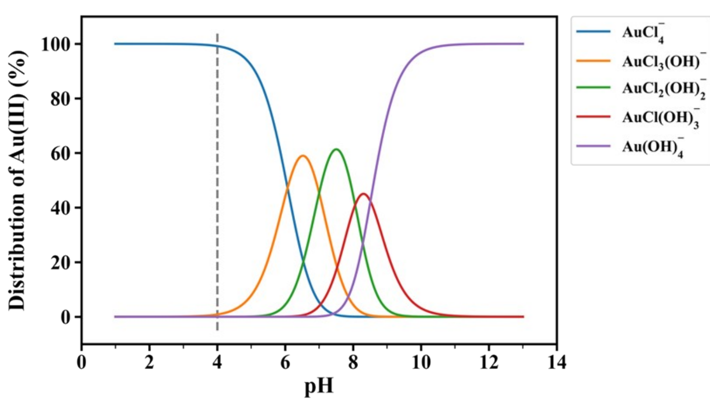

Fig. S3. The speciation distribution of Au(III) at different pH values.