Supporting Information

Selective Metal Recovery by Mucin: Turning Gold from Wastewater into a Peroxymonosulfate-activated Catalyst

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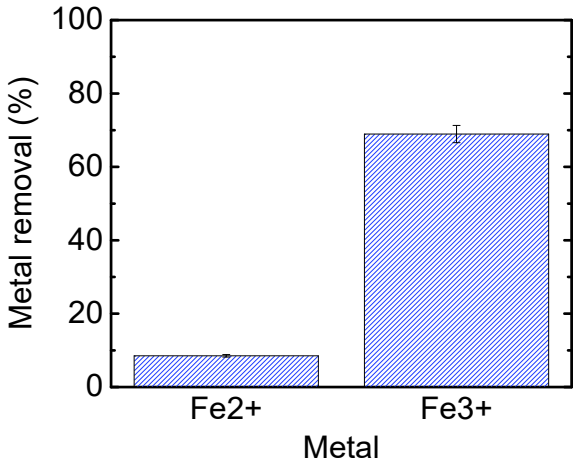


Figure S1. Fe^{3+} vs. Fe^{2+} removal by 0.1 g L^{-1} mucin in a 0.05 mM solution for each ion.

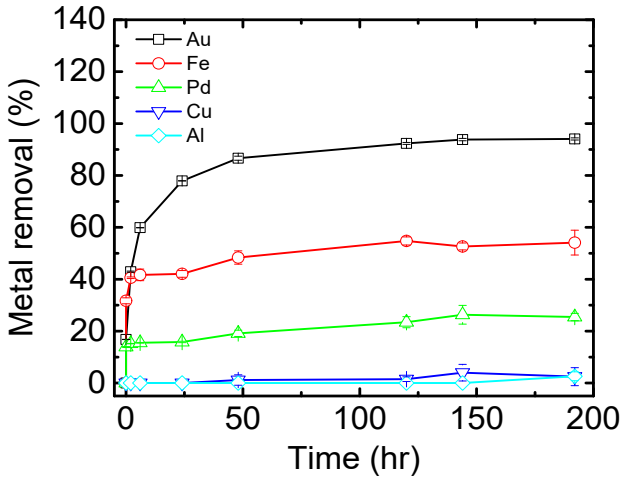


Figure S2. Kinetics of metal removal in the mixed-metal solution during 200 hr.

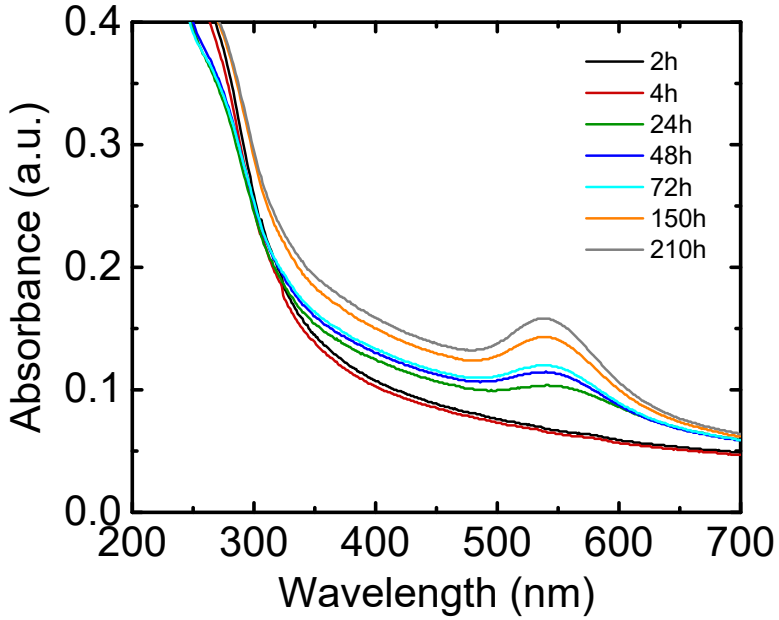


Figure S3. UV-VIS spectra of Au nanoparticles formation with mucin over several time points.

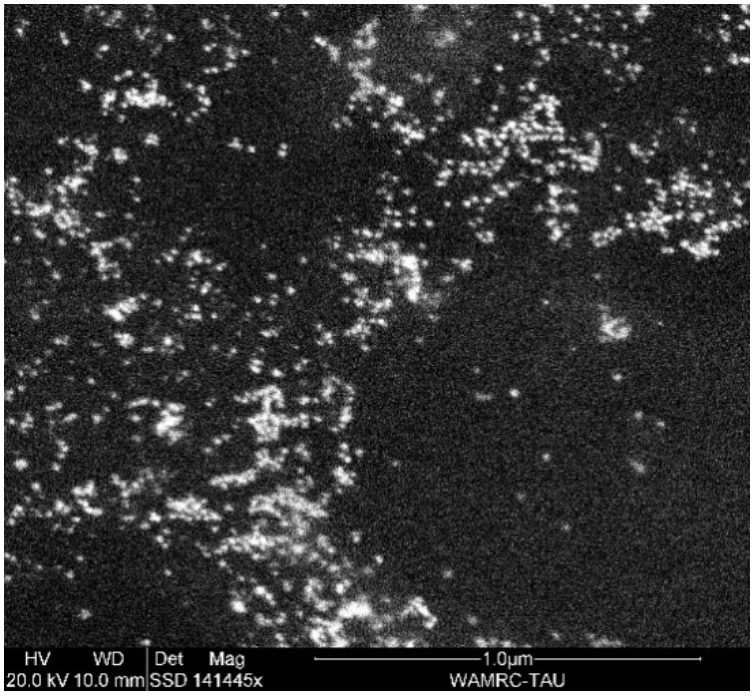


Figure S4. Scanning electron microscopy image in back-scattered mode of Au nanoparticles formed in the isolated Au metal solution.

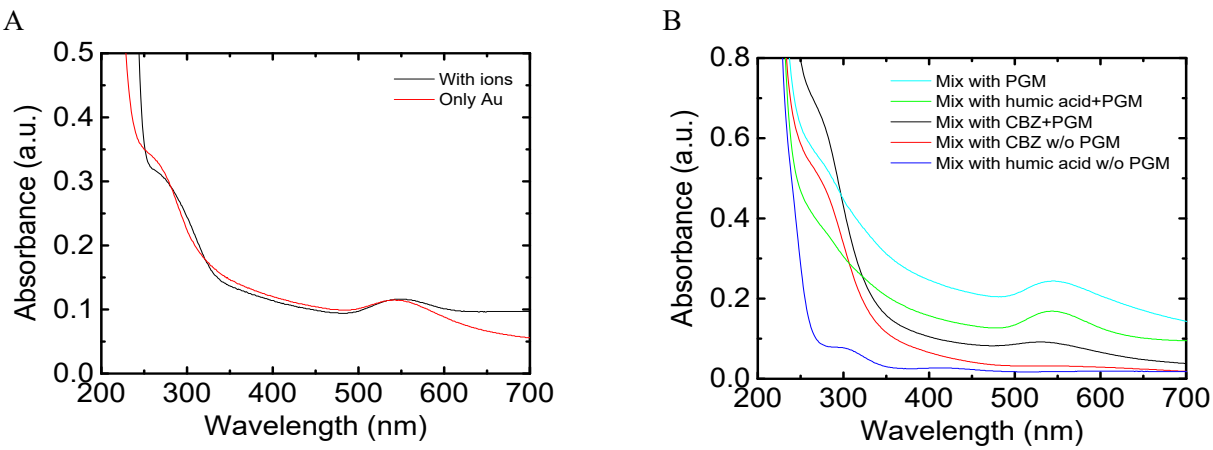


Figure S5. Au nanoparticles formation with the presence of (A) small cations (Na^{+}, Ca^{2+}, K^{+}) and mucin. (B) Organic substances (CBZ and humic acid) with and without mucin.

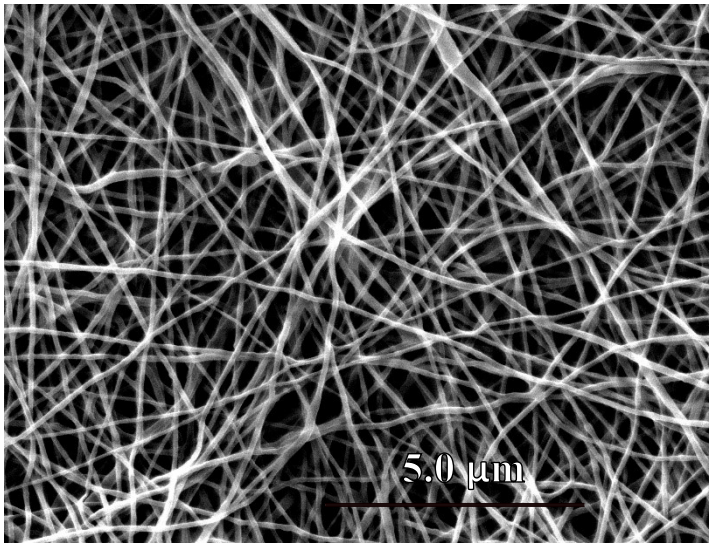
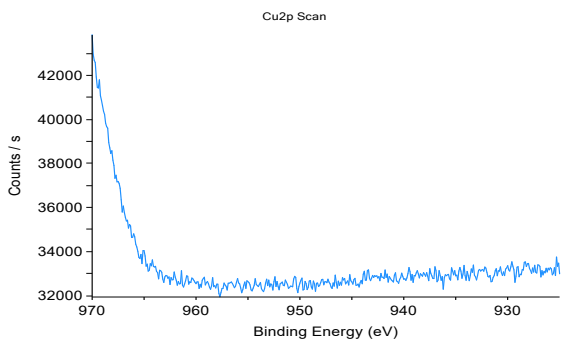


Figure S6. SEM image of mucin-based nanofibers.

A



B

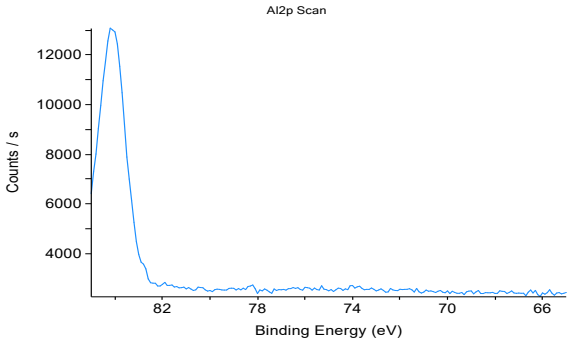


Figure S7. XPS of (A) Cu and (B) Al in the mixed-metal solution after adsorption test with mucin NFs.

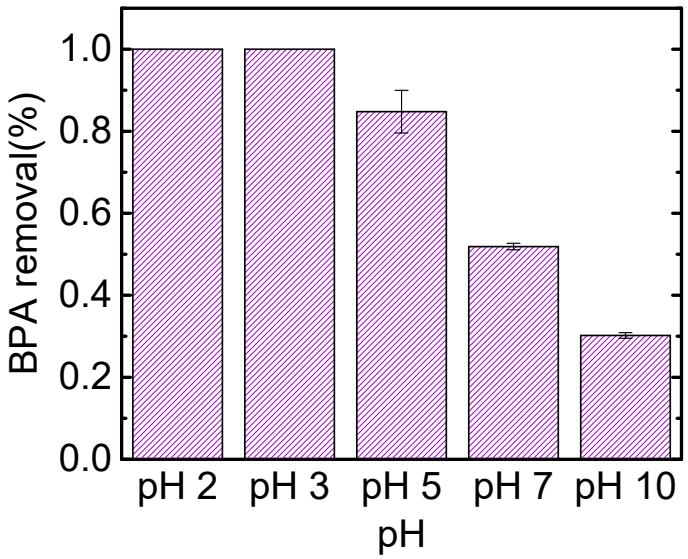


Figure S8. Effect of initial pH on the removal of BPA in the presence of Au@mucin catalyst and PMS.

Table S1. Second-order Kinetics values for Au adsorption by mucin, calculated with the equation: $q_{(t)} = \frac{q_e^2 * k_2 * t}{1 + q_e * k_2 * t}$

		0.025 mM	0.05 mM	0.1 mM
k_2	[g/mg/hr]	0.00187	3.21199E-4	7.57026E-5
q_e	[mg g^{-1}]	17.22575	64.81353	156.35628
R^2	-	0.969837	0.990882	0.995377

Table S2. Reduction potentials of metals

(Petr Vanýsek, in *CRC Handbook of Chemistry and Physics*, ed. William M. Haynes, 92th edn., 2011**)**

Reaction	Potential (E^0 vs. SHE, eV)
$2RSH \rightarrow RS-SR + 2H^+ + 2e^-$	-0.318
$Au^{3+} + 3e^- \rightarrow Au$	1.498
$Pd^{2+} + 2e^- \rightarrow Pd$	0.951
$Fe^{3+} + e^- \rightarrow Fe^{2+}$	0.771
$Cu^{2+} + 2e^- \rightarrow Cu$	0.3419
$Fe^{3+} + 3e^- \rightarrow Fe$	-0.037
$Fe^{2+} + 2e^- \rightarrow Fe$	-0.447
$Al^{3+} + 3e^- \rightarrow Al$	-1.662

Table S3. Chemical elements from XPS analysis before EDTA cleaning

Name	*Peak BE*	*FWHM eV*	*Area (P) CPS.eV*	*Atomic %*
C 1s	285.23	3.25	873209.41	70.71
O 1s (~8% area is Pd 3p3)	532.40	3.41	744047.87	23.73
N 1s	399.90	3.02	65916.00	3.36
Fe 2p	711.91	6.02	150920.93	1.09
P 2p	133.56	1.61	9770.52	0.55
Au 4f7	84.12	2.34	46806.63	0.30
Pd 3d5	338.23	2.32	36060.75	0.26

Table S4. Chemical elements after EDTA cleaning

Name	*Peak BE*	*FWHM eV*	*Area (P) CPS.eV*	*Atomic %*
Au 4f	85.52	7.43	216238.56	0.30
N 1s	399.93	3.78	29209.61	0.59
O 1s	532.24	4.75	1948135.44	24.61
C 1s	285.06	5.27	2361583.24	74.51