Electronic Supplementary Material

Preparation of a novel lactose-lignin hydrogel catalyst with self-reduction capacity for nitrogenous wastewater treatment

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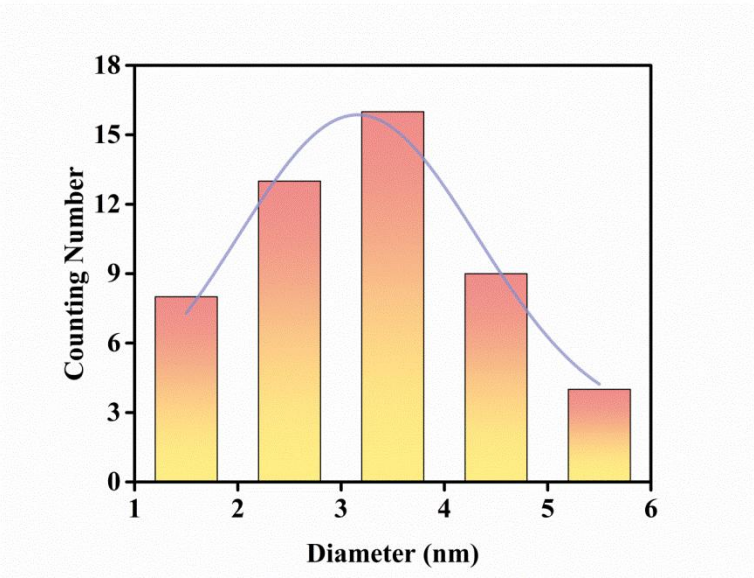

Fig. S1. The diameter dispersion of silver nanoparticles in Ag@CLA/SL/PAA-0.5

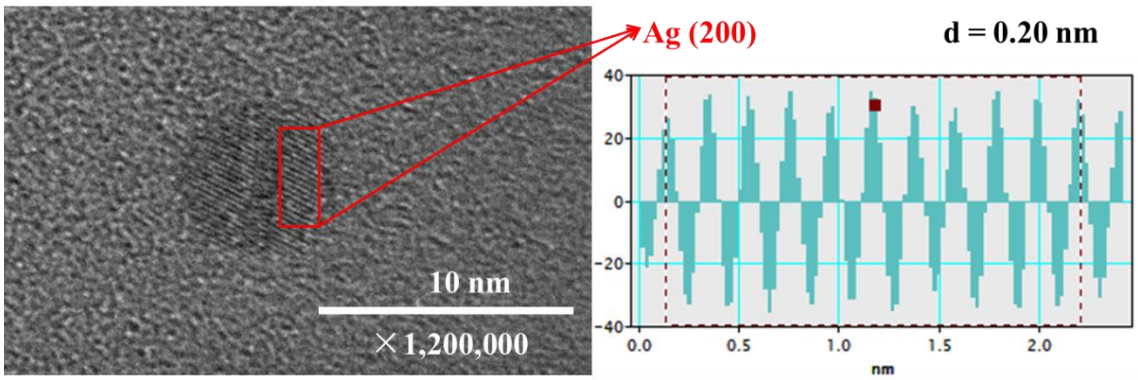

Fig. S2 HR-TEM displaying the lattice fringes and d-spacing of silver nanoparticle.

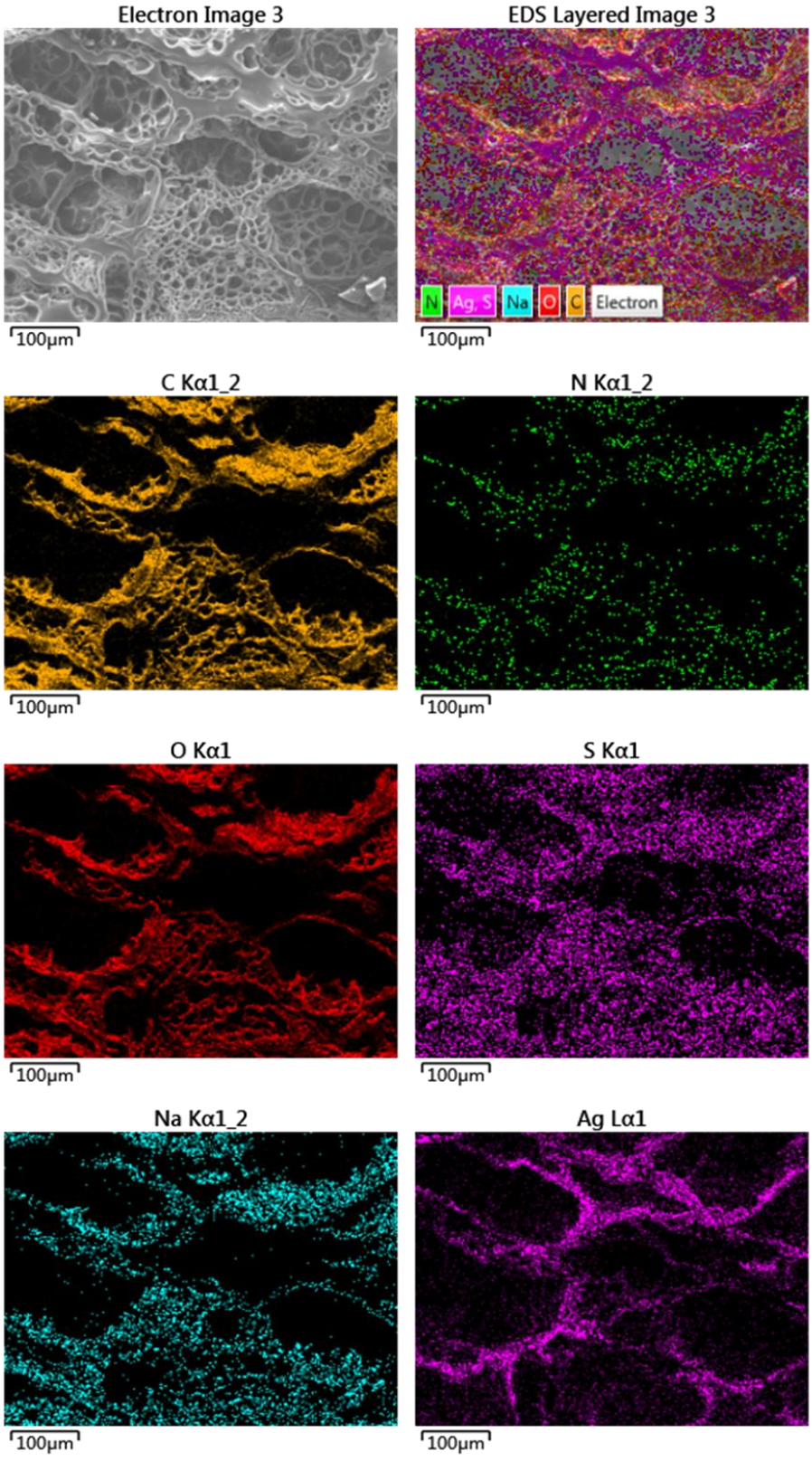

Fig. S3. The SEM-EDX results of Ag@CLA/SL/PAA-0.5.

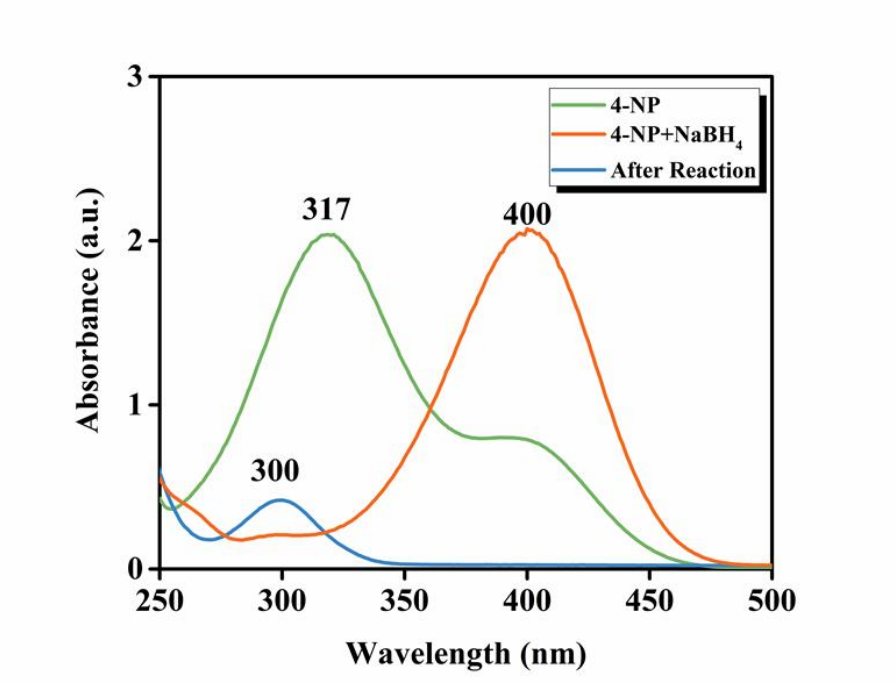

Fig. S4. Variation of UV-vis spectra throughout the catalytic process

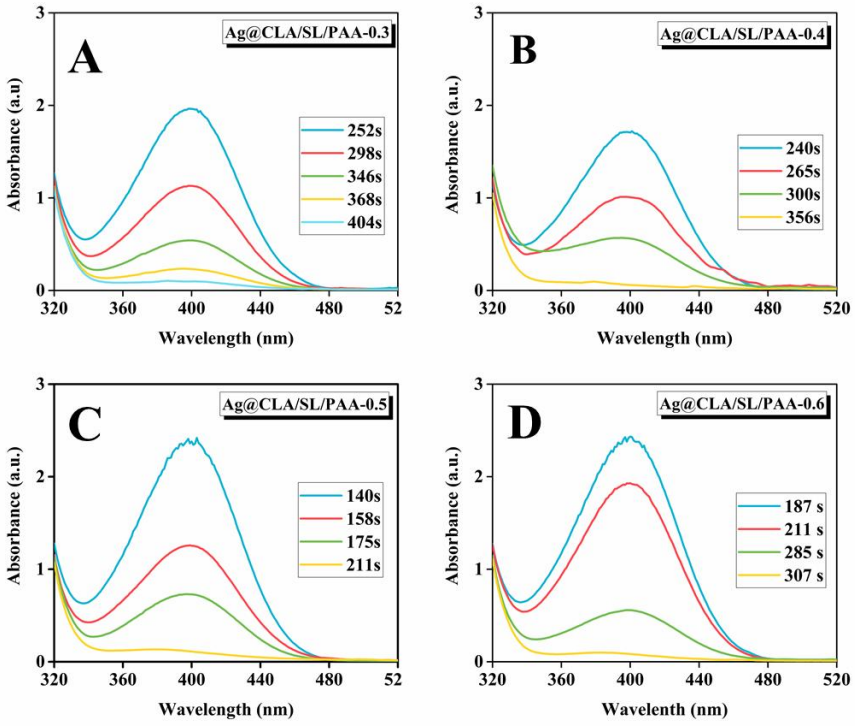

Fig. S5. The UV-vis spectrum of the catalytic process: (A) Ag@CLA/SL/PAA-0.3; (B) Ag@CLA/SL/PAA-0.4; (C) Ag@CLA/SL/PAA-0.5; (D) Ag@CLA/SL/PAA-0.6

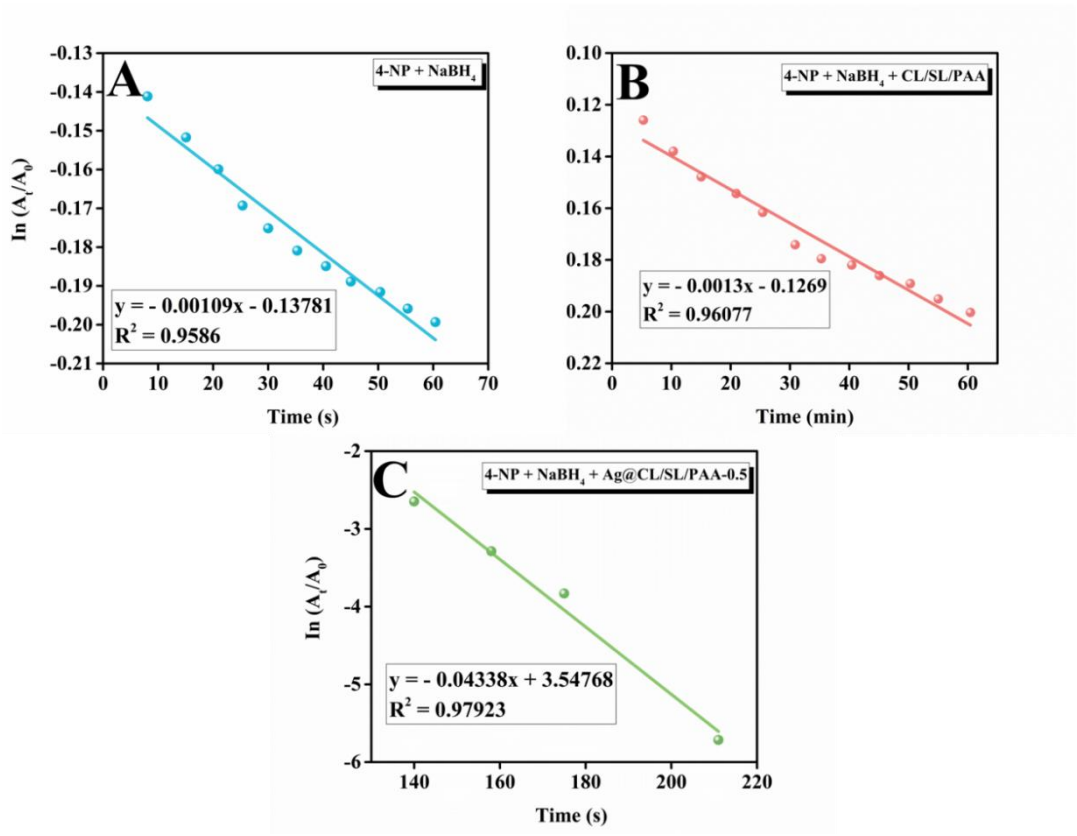

Fig. S6. The linear fitting: System A; System B; and System C.

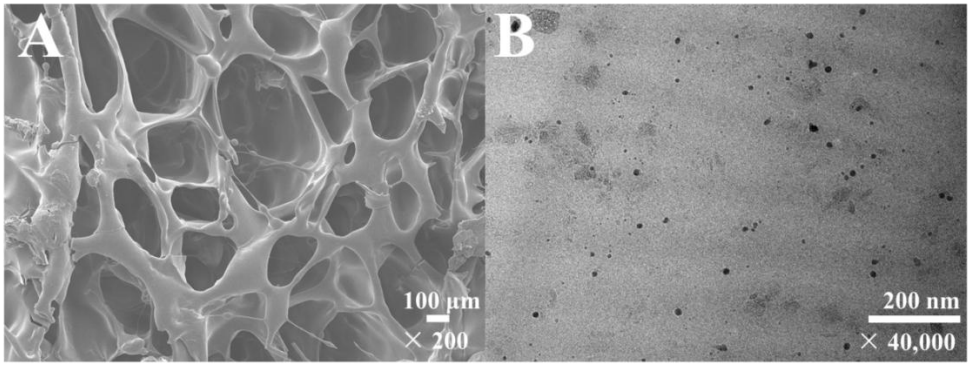

Fig. S7. (A) SEM image of recycled Ag@CL/SL/PAA-0.5, (B) TEM image of recycled Ag@CL/SL/PAA-0.5.

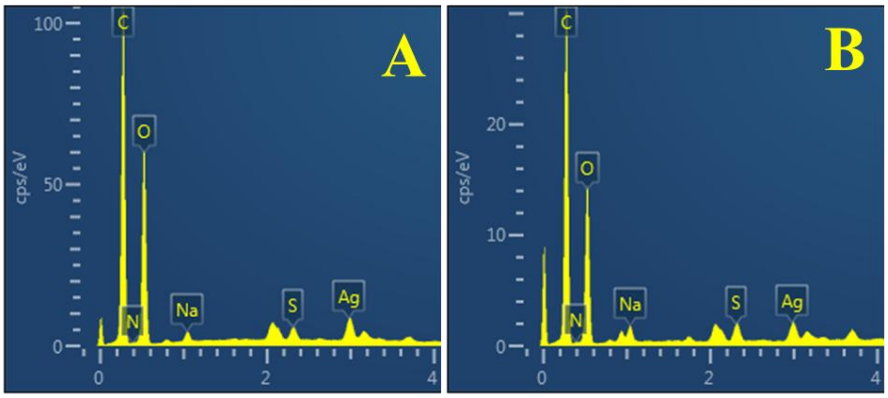

Fig. S8. The SEM-EDS patterns: (A) Ag@CL/SL/PAA-0.5; (B) Recycled Ag@CL/SL/PAA-0.5.

Table S1. The detail index of Lactose

Product	**Lactose**
Type	β-Lactose
CAS	5965-66-2
Formula	$C_{12}H_{22}O_{11}$
Formula Weight	342.3
Assay	98%
Heavy metals (AS PB)	0%
Loss on drying	0%
Specific optical rotation(c=10, H_2O/NH_3)	+55.4°
Sulfated Ash	0%
Water by Karl Fischer	0%
Purity (β-Lactose)	70% β-Lactose, 30% α-Lactose
Solubility (color)	Colorless
Solubility (Turbidity)	50g/mL

Table S2. Formulation of simulated seawater solution

Reagent	Quality (g/L)
NaCl	24.534
$MgCl_2$	11.112
Na_2SO_4	4.094
$CaCl_2$	1.160
KCl	0.695

Table S3. The SEM-EDX data of Ag@CL/SL/PAA-0.5

Element	Line Type	Apparent Concentration	k Ratio	Wt%	Wt% Sigma	Atomic %	Standard Label	Factory Standard
C	K series	65.82	0.65822	48.41	0.22	57.15	C Vit	Yes
N	K series	5.00	0.00890	3.49	0.27	3.53	BN	Yes
O	K series	55.37	0.18633	42.92	0.22	38.05	SiO_2	Yes
Na	K series	1.49	0.00630	0.76	0.03	0.47	Albite	Yes
S	K series	1.85	0.01595	0.71	0.02	0.31	FeS_2	Yes
Ag	L series	8.42	0.08418	3.71	0.06	0.49	Ag	Yes
Total:				100.00		100.00		

Table S4. The SEM-EDX data of recycled Ag@CL/SL/PAA-0.5

Element	Line Type	Apparent Concentration	k Ratio	Wt%	Wt% Sigma	Atomic %	Standard Label	Factory Standard
C	K series	38.84	0.38844	51.29	0.29	59.90	C Vit	Yes
N	K series	3.45	0.00613	4.52	0.35	4.53	BN	Yes

O	**K series**	**26.27**	**0.08839**	**38.87**	**0.27**	**34.08**	**SiO_2**	**Yes**
Na	**K series**	**1.18**	**0.00497**	**1.04**	**0.04**	**0.64**	**Albite**	**Yes**
S	**K series**	**1.48**	**0.01273**	**1.00**	**0.02**	**0.44**	**FeS_2**	**Yes**
Ag	**L series**	**4.19**	**0.04191**	**3.28**	**0.07**	**0.43**	**Ag**	**Yes**
Total:				**100.00**		**100.00**		