Electronic Supplementary Material (ESI) for RSC Advances.
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Supplementary figures

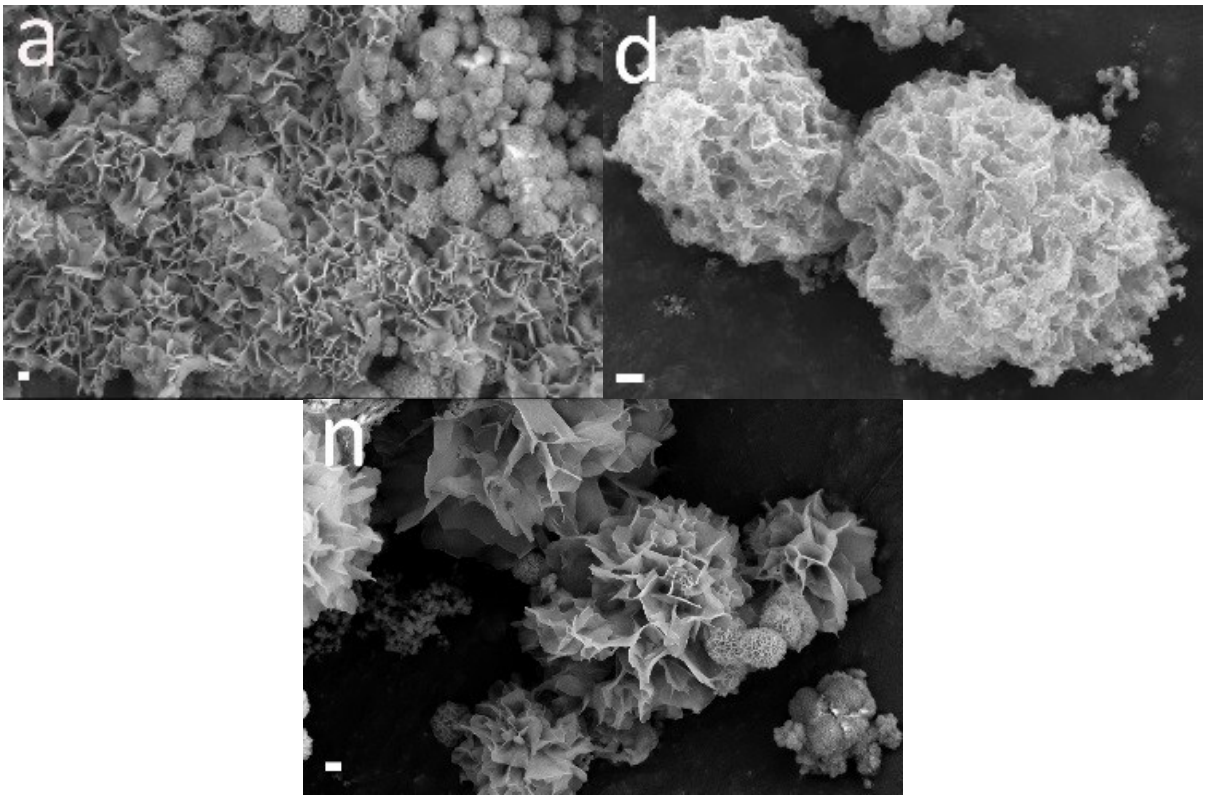
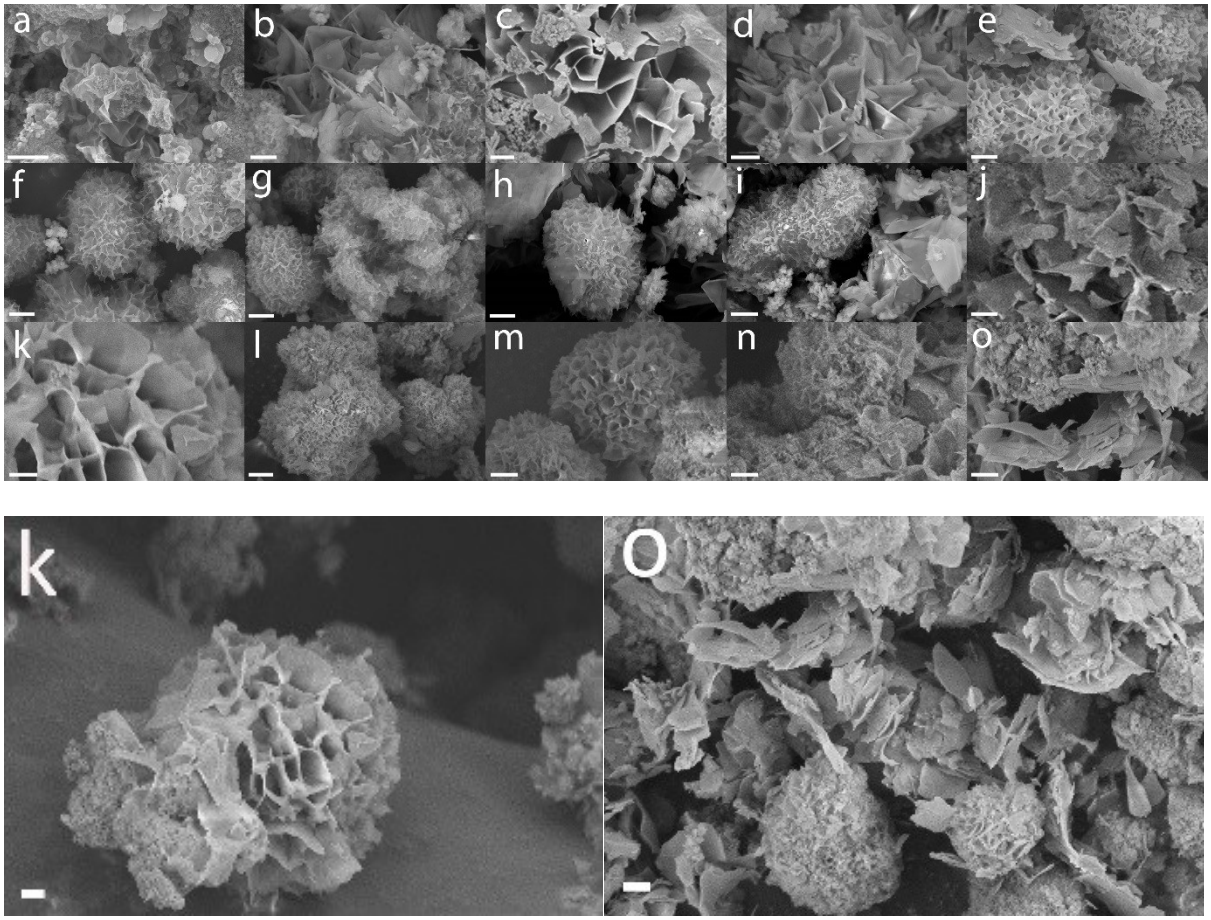


Figure S1. Low magnification SEM images of Cu(II)-lipase hNFs synthesised at 21°C (Figure 1): a) Cu(II)-0.2mM, lipase-0.5mg/ml; d) Cu(II)-0.8mM, lipase-0.5/ml; n) Cu(II)-0.8mM, lipase-0.02mg/ml. Scale bar = 1µm.



B

Figure S2. SEM images of Cu(II)-lipase hNFs synthesised at 4°C, with metal concentrations (left to right) of: 0.2mM, 0.4mM, 0.6mM, 0.8mM and 1mM, at protein concentration (top to bottom) of 0.5 mg/ml (a-e), 0.1 mg/ml (f-j) and 0.02 mg/ml (k-o). Scale bar: 1µm.

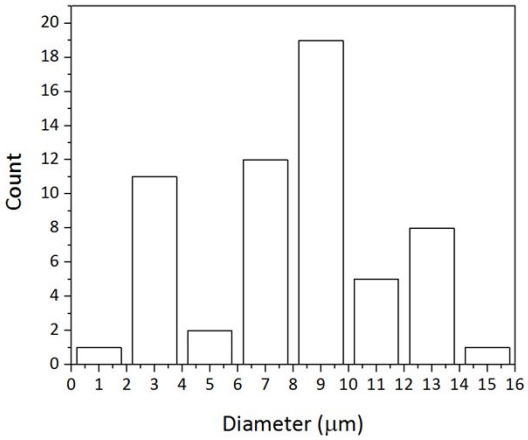
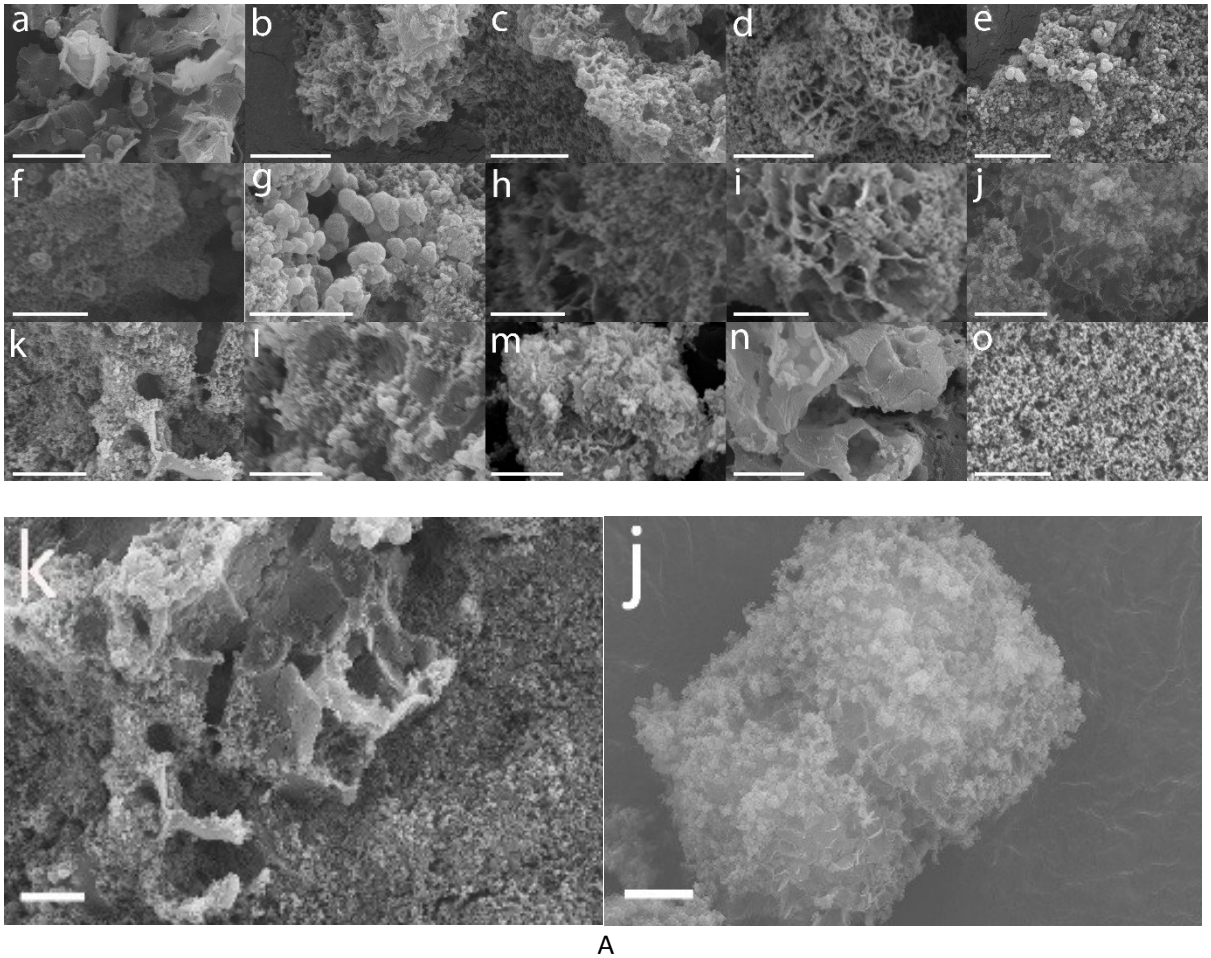
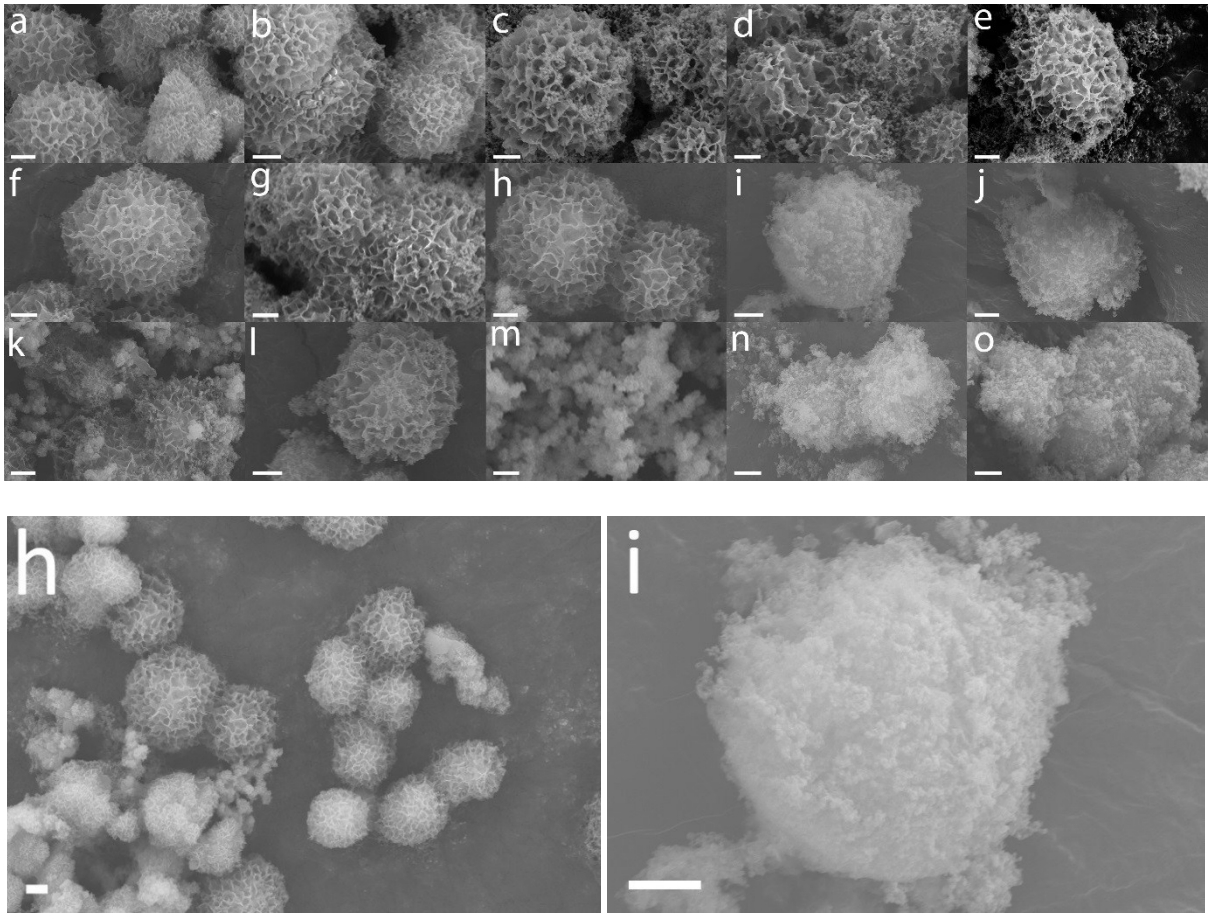


Figure S3. Size distribution graph for Cu(II)-lipase hNFs synthesised at 21°C, (Cu(II)-0.8mM, lipase-0.02mg/ml).



A

Figure S4. SEM images of Fe(ll)-lipase hNFs (a-o) synthesised at 21°C with metal concentrations (left to right) of: 0.2mM, 0.4mM, 0.6mM, 0.8mM and 1mM, at protein concentration (top to bottom) of 0.5 mg/ml (a-e), 0.1 mg/ml (f-j) and 0.02 mg/ml (k-o). Scale bar: 1µm.



B

Figure S5. SEM images of Fe(II)-lipase hNFs (a-o) synthesised at 4°C with metal concentrations (left to right) of: 0.2mM, 0.4mM, 0.6mM, 0.8mM and 1mM, at protein concentration (top to bottom) of 0.5 mg/ml (a-e), 0.1 mg/ml (f-j) and 0.02 mg/ml (k-o). Scale bar: 1µm.

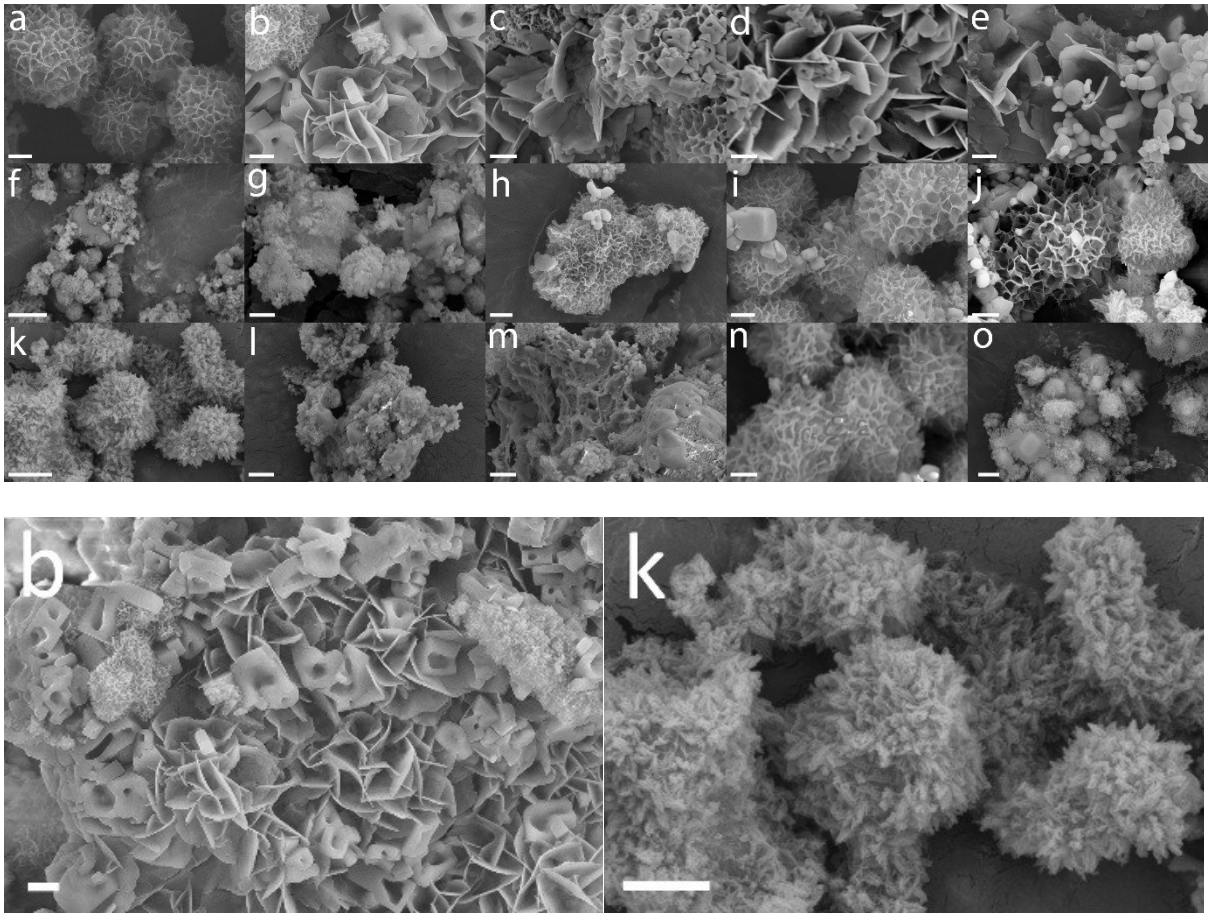


Figure S6. SEM images of Ag(I)-lipase hNFs (a-o) synthesised at 21°C with metal concentrations (left to right) of: 0.2mM, 0.4mM, 0.6mM, 0.8mM and 1mM, at protein concentration (top to bottom) of 0.5 mg/ml (a-e), 0.1 mg/ml (f-j) and 0.02 mg/ml (k-o). Scale bar: 1µm.

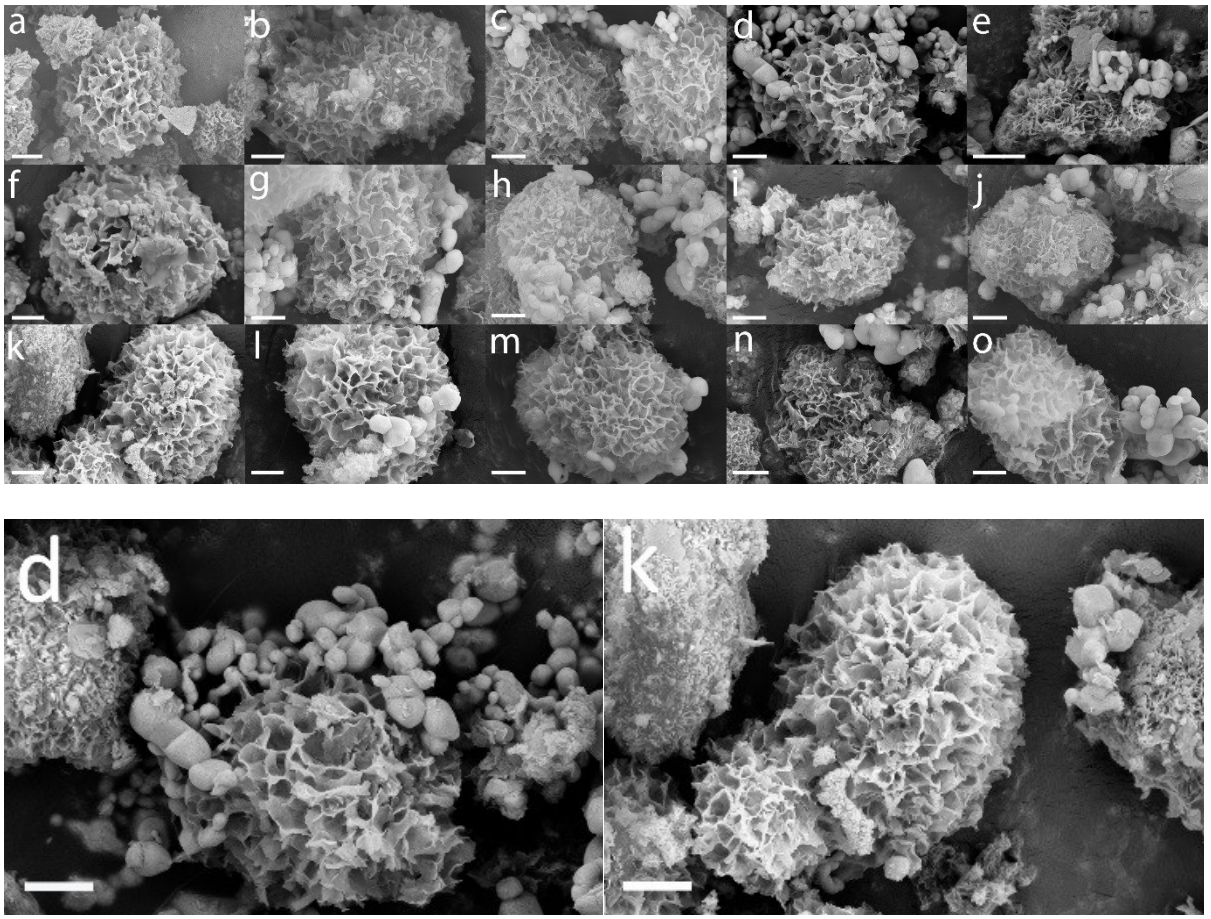


Figure S7. SEM images of Ag(I)-lipase hNFs (a-o) synthesised at 4°C with metal concentrations (left to right) of: 0.2mM, 0.4mM, 0.6mM, 0.8mM and 1mM, at protein concentration (top to bottom) of 0.5 mg/ml (a-e), 0.1 mg/ml (f-j) and 0.02 mg/ml (k-o). Scale bar: 1µm.

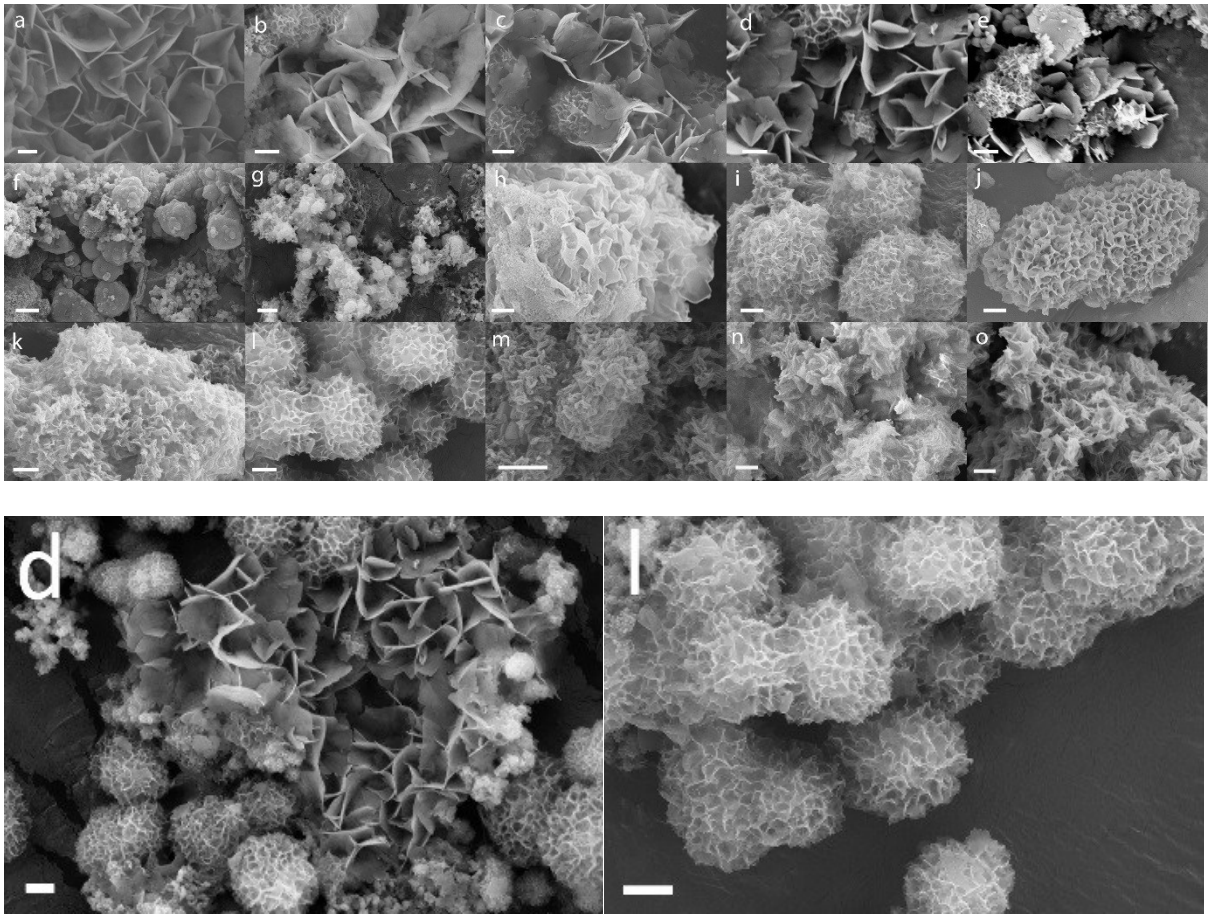
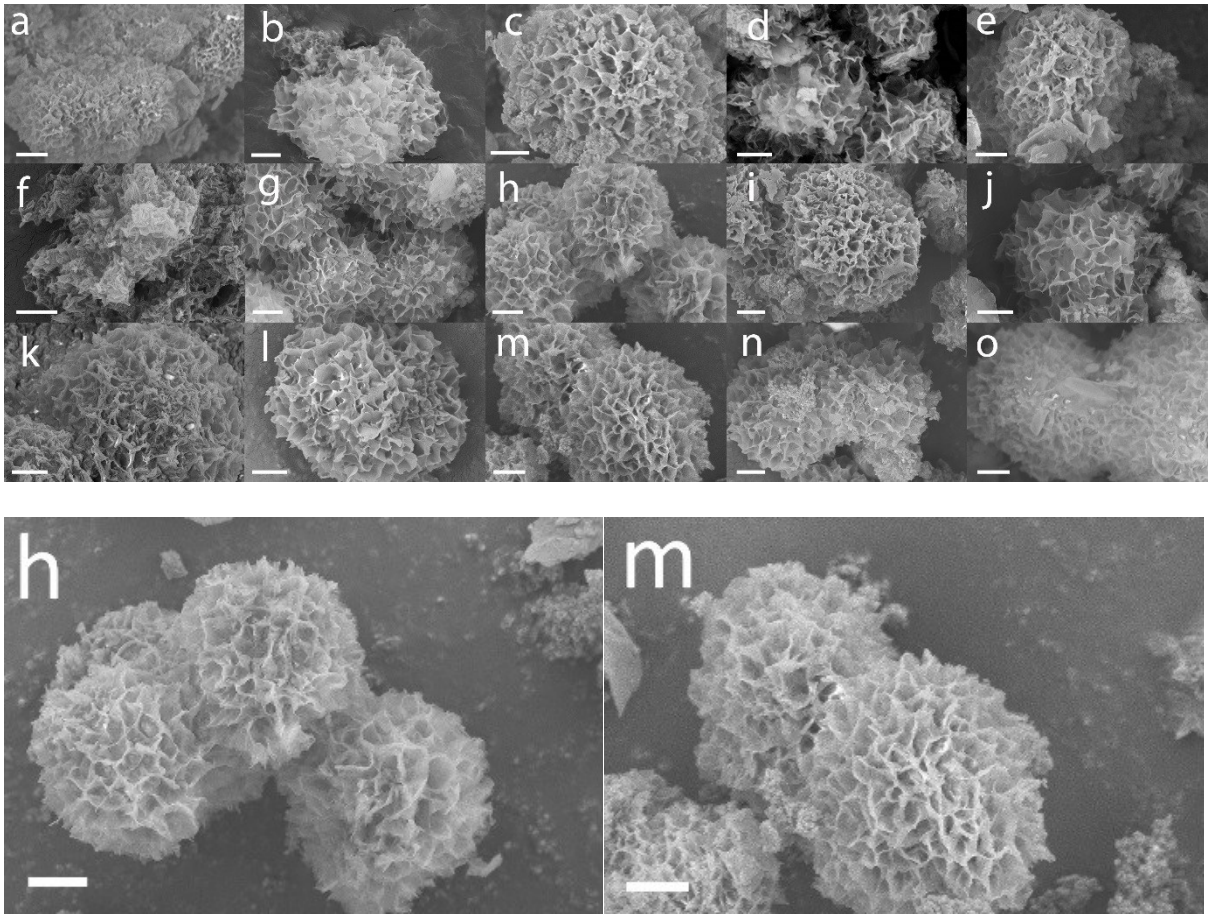


Figure S8. SEM images of Au(III)-lipase hNFs (a-o) synthesised at 21°C with metal concentrations (left to right) of: 0.2mM, 0.4mM, 0.6mM, 0.8mM and 1mM, at protein concentration (top to bottom) of 0.5 mg/ml (a-e), 0.1 mg/ml (f-j) and 0.02 mg/ml (k-o). Scale bar: 1µm.



B

Figure S9. SEM images of Au(III)-lipase hNFs (a-o) synthesised at 4°C with metal concentrations (left to right) of: 0.2mM, 0.4mM, 0.6mM, 0.8mM and 1mM, at protein concentration (top to bottom) of 0.5 mg/ml (a-e), 0.1 mg/ml (f-j) and 0.02 mg/ml (k-o). Scale bar: 1µm.

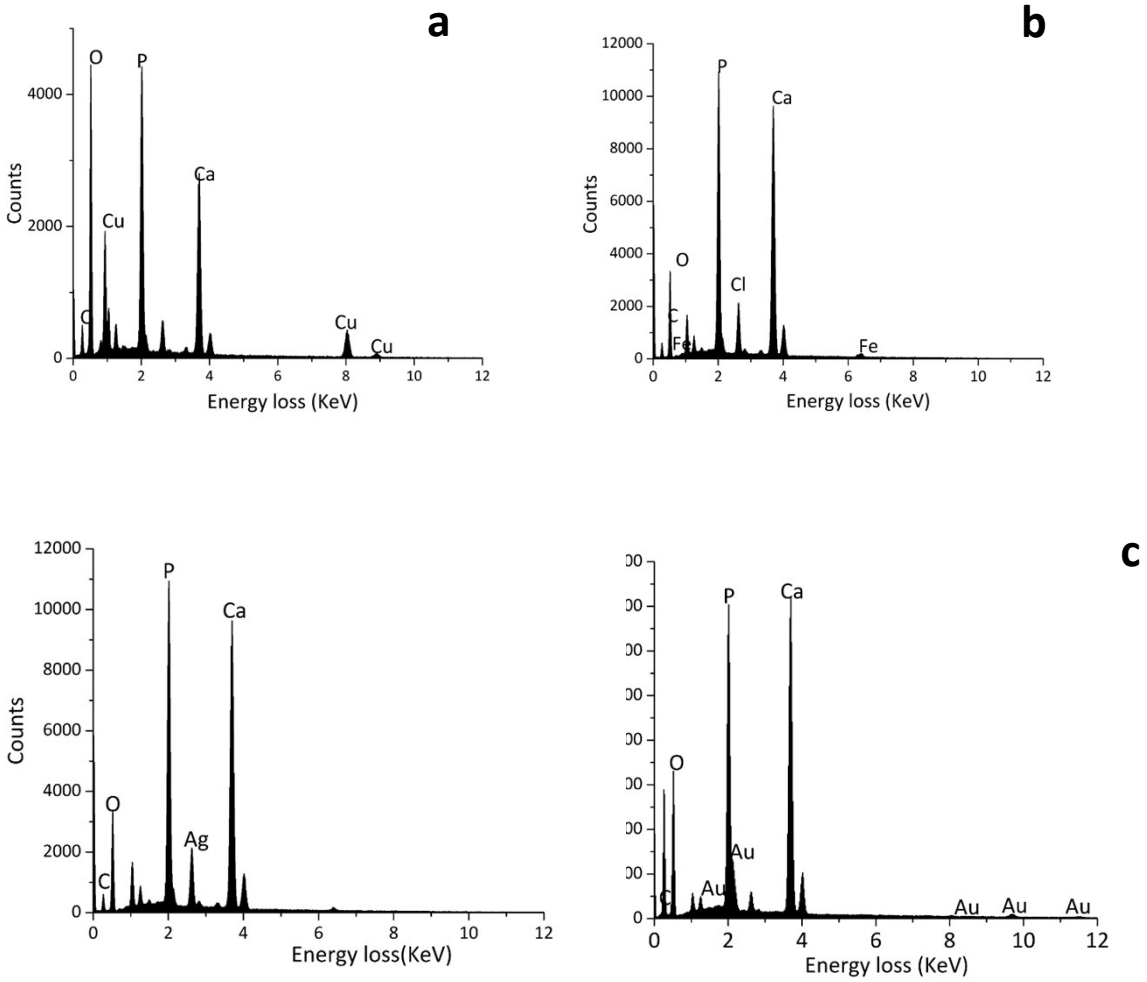


Figure S10. Energy-dispersive X-ray spectroscopy (EDX) analysis of hNFs; synthesised at 4°C [Fe(II)-lipase hNFs: (Fe(II)-(0.6mM), lipase-(0.1mg/ml)], and synthesised at 21°C [Cu(II)-lipase hNFs: (Cu(II)-0.8mM, lipase-0.02mg/ml), Ag(I)-lipase hNFs: (Ag(I)-0.4mM, lipase-0.5mg/ml), Au(III)-lipase hNFs: (Au(III)-0.4mM, lipase-0.02mg/ml)].

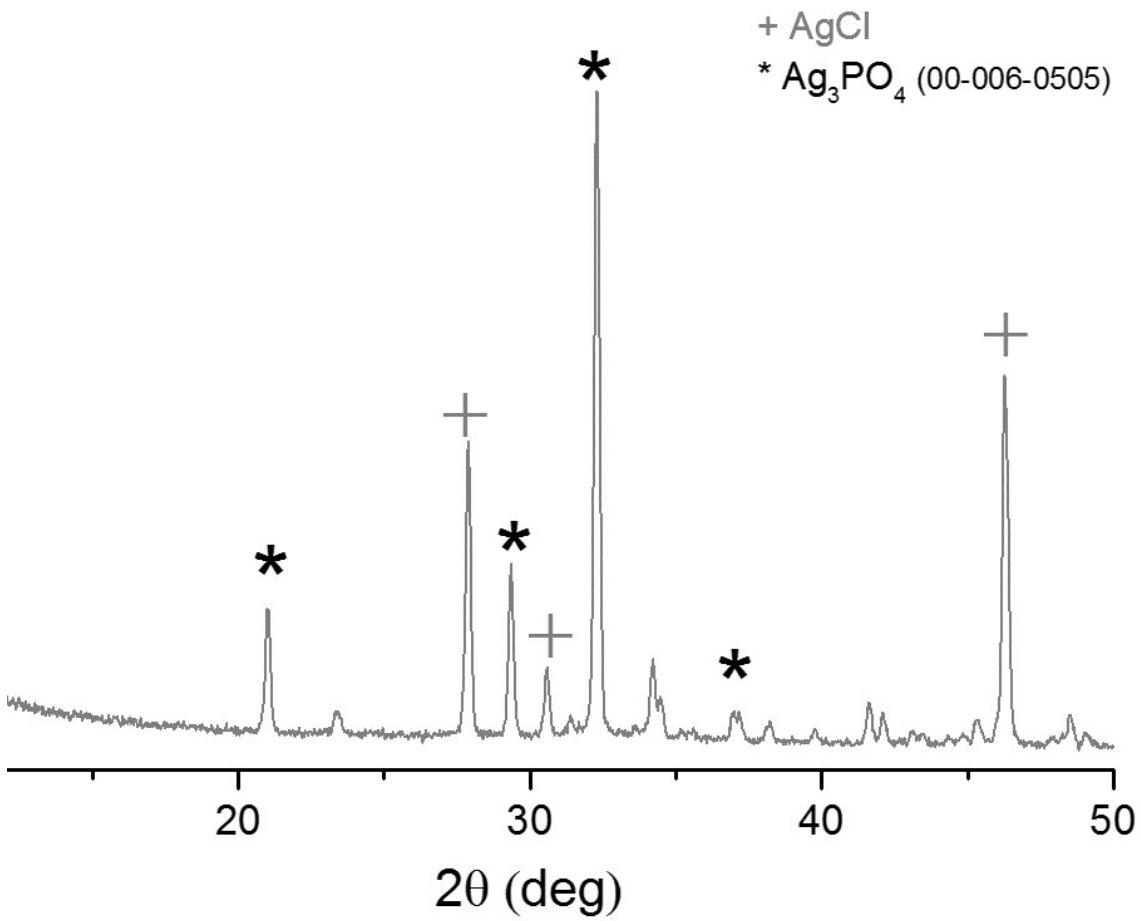


Figure S11. Powder X-ray diffraction spectra of hNFs synthesised at 21°C, Ag(I)-0.4mM, lipase-0.5mg/ml.

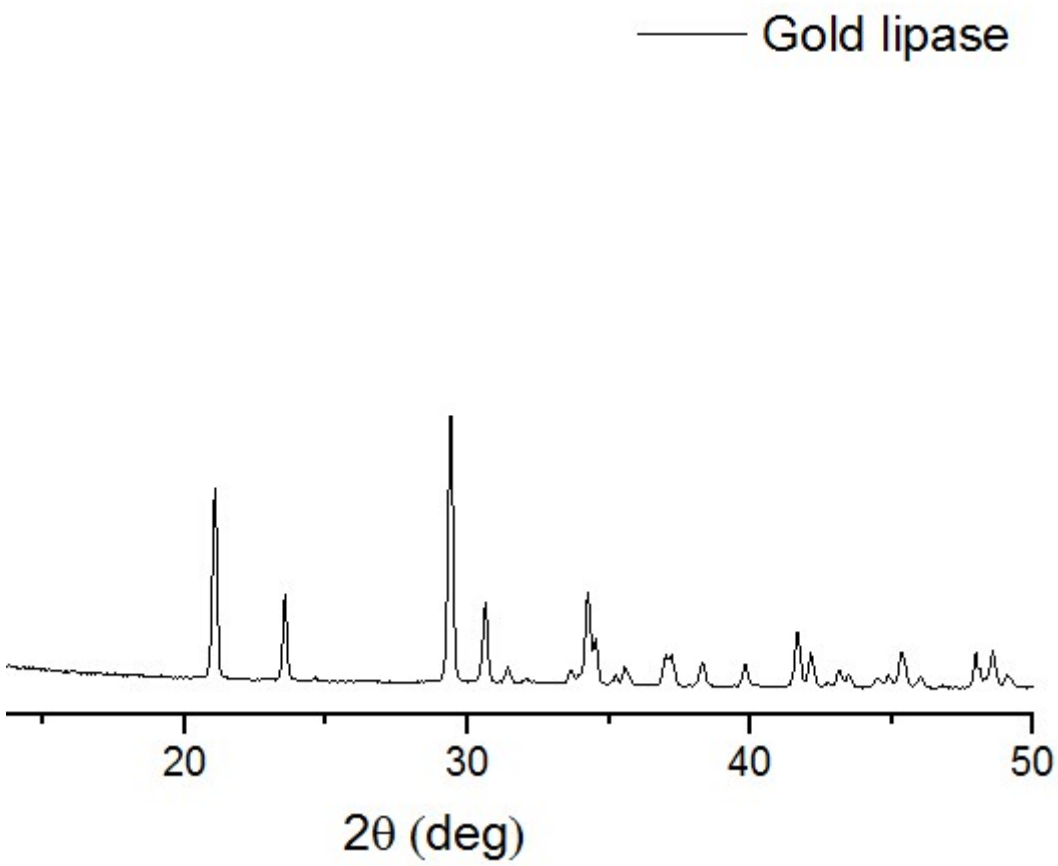


Figure S12. Powder X-ray diffraction spectra of hNFs synthesised at 21°C, Au(lll)-0.4mM, lipase-0.02mg/ml.

Table S1. The specific activity (u/mg) of lipase in the nanoflowers at different lipase to metal ion ratios, synthesised at 4°C and 21°C. Red box indicated the condition with highest enzyme activity for each metal ion. The black box indicates the condition with the lowest enzyme activity for each metal ion.

	METAL ION CONCENTRATION					
Lipase load	0.2 mm	0.4 mm	0.6 mm	0.8 mm	1 mm	
0.5 mg.ml^{-1}	1309	1393	1402	1390	1284	Fe(II)-lipase hNFs 4°C
0.1 mg.ml^{-1}	1225	1347	1463	1328	1221	
0.02 mg.ml^{-1}	1271	1339	1389	1201	1203	
0.5 mg.ml^{-1}	1313	1345	1452	1331	1203	Fe(II)-lipase hNFs 21°C
0.1 mg.ml^{-1}	1172	1233	1345	1057	1073	
0.02 mg.ml^{-1}	1122	1191	1129	1045	1071	
0.5 mg.ml^{-1}	716	975	1068	1324	1098	Cu(II)-lipase hNFs 4°C
0.1 mg.ml^{-1}	1017	1173	1294	1359	1111	
0.02 mg.ml^{-1}	1261	1301	1347	1398	1132	
0.5 mg.ml^{-1}	1326	1388	1407	1484	1187	Cu(II)-lipase hNFs 21°C
0.1 mg.ml^{-1}	1411	1438	1457	1500	1455	
0.02 mg.ml^{-1}	1461	1478	1492	1522	1428	
0.5 mg.ml^{-1}	1395	1484	1526	1517	1513	Ag(I)-lipase hNFs 4°C
0.1 mg.ml^{-1}	1286	1340	1249	1154	1117	
0.02 mg.ml^{-1}	894	940	984	1096	883	
0.5 mg.ml^{-1}	1437	1567	1486	1430	1364	Ag(I)-lipase hNFs 21°C
0.1 mg.ml^{-1}	1388	1440	1420	1290	1190	
0.02 mg.ml^{-1}	1329	1271	1245	1221	886	
0.5 mg.ml^{-1}	1113	1189	1249	1332	1172	Au(III)-lipase hNFs 4°C
0.1 mg.ml^{-1}	1212	1248	1385	1427	1165	
0.02 mg.ml^{-1}	1238	1395	1449	1445	1155	
0.5 mg.ml^{-1}	1321	1262	1230	1171	1092	Au(III)-lipase hNFs 21°C
0.1 mg.ml^{-1}	1327	1331	1389	1239	1165	
0.02 mg.ml^{-1}	1352	1483	1408	1378	1047	