Supporting Information

Green synthesis of palladium nanoparticles using lentinan for catalytic activity and biological applications

Zengsheng Han,[a] Le Dong,[a] Jin Zhang,[b] Tianming Cui,[a] Shengfu Chen,[c] Guanglong Ma,[c] Xiaolei Guo,[a] Longgang Wang[a]*

a Key Laboratory of Applied Chemistry, College of Environmental and Chemical Engineering, Yanshan University, Qinhuangdao,066004, China.

b College of Chemistry and Environmental Engineering, Shanxi Datong University, Datong, 037009, China.

c Key Laboratory of Biomass Chemical Engineering of Ministry of Education, College of Chemical and Biological Engineering, Zhejiang University, Hangzhou, 310027, China.

Experimental Details

Materials

Sodium tetrachloropalladate (Na_2PdCl_4), $NaBH_4$, hydrogen peroxide (H_2O_2), sodium chloride, potassium chloride, 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) and 4-nitrophenol (4-NP) were purchased from Aladdin. Lentinus edodes was purchased from a local supermarket. Lentinan (LNT) was extracted according to previous reports[1]. All cell lines were purchased from China Center for Typical Culture Collection.

Preparation of Pd_n-LNT NPs

1 mL of 1 mg/mL LNT solution was mixed with 1 mM Na_2PdCl_4 in metal bath at 50 ℃ for 6 h. The molar ratios of LNT to Na_2PdCl_4 were 1:150, 1:200, and 1:250, respectively. The mixtures were dialyzed against water to gain Pd_n-LNT NPs.

Size and zeta potential measurements

The size and zeta potential measurements of the Pd_n-LNT NPs were measured by dynamic light scattering (DLS) technology at 25℃. Pd_{150}-LNT NPs (0.6 mg/mL) were dissolved in different pH acetate buffer solution, respectively. The sizes of the Pd NPs inside of Pd_{150}-LNT NPs were characterized by HT7700 transmission electron microscope (TEM).

Catalytic activity

(a) 200 μL of 0.6 mM 4-NP and 750 μL of deionized water were added in a cuvette. Then, 50 μL of 9.1 μM Pd_{150}-LNT and 1 mL of 0.5 M fresh $NaBH_4$ solution were added. The reaction system was monitored every 3 min using UV-TU1810.

(b) 200 μL of 0.6 mM 4-NP solution and deionized water (750, 700, and 650 μL) were mixed in a cuvette, respectively. Then, 50, 100 and 150 μL of 4.55 μM Pd_{150}-LNT and 1 mL of 0.5 M fresh $NaBH_4$ solution were added, respectively. The absorbance at 400 nm was monitored by UV-TU1810.

DPPH free radical scavenging activity

DPPH free radical scavenging activity was performed according to previous reports[2]. Briefly, 0.5 mL of 0.1 mM DPPH was mixed 1.0 mL of Pd_{150}-LNT NPs with different concentrations (0.27-1.33 mg/mL) and incubated in dark for 30 min. The absorbance of samples and control groups was record at 517 nm by UV-TU1810.

MTT assay

A549 cells and HCT116 cells were cultured in 96-well tissue culture plates (10^4 cells/well) in 200 μL high-glucose DMEM medium (10% FBS), respectively. After one day, LNT, Pd_{150}-LNT, Pd_{200}-LNT, Pd_{250}-LNT, and PEI were added in high-glucose DMEM medium to replace previous medium. After 24 h, cells were incubated with 100 μL of high-glucose DMEM medium with 1.2 mM MTT for another 4 h. Then, the medium replaced by 150 μL DMSO. The absorbance at 490 nm was read using SpectraMaxM2. Cell viability was calculated by comparison absorbance of samples with control ones.

The effect of ionic strength on the stability in aqueous media was shown in **Fig. S1**. Pd_{150}-LNT NPs also had stability in aqueous media with an increasing ionic strength.

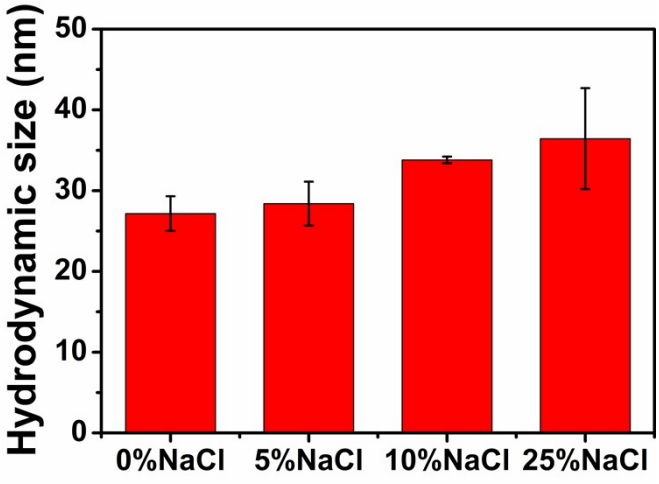

Fig. S1 The stability of Pd_{150}-LNT NPs in aqueous media with an increasing ionic strength

References

(1) Y. Zhang, S. Li, X. Wang, L. Zhang and P. C. K. Cheung, *Food Hydrocolloids*, 2011, **25**, 196-206.

(2) S. Kandi and A. L. Charles, *Food Chem.* 2019, **287**, 338-345.