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SUPPORTING INFORMATION

One-step Redox-induced Confined Pt Nanoparticles for Reduction of Nitroaromatics

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Turnover frequency (TOF) was calculated according to the following equation:

$$TOF = \frac{moles\ of\ reactant}{moles\ of\ catalysts \times reaction\ time} \quad \text{(Equation S1)}$$

It is worth noting that we assume that all Pt atoms exhibit the same catalytic activity. The moles of the reactant were calculated according to the concentration, volume and conversion of the reactants. In this work, the TOF values were calculated using related data when the conversion of the substitute reaches 90%. The moles of the catalyst were calculated using the weight and the loading of Pt in the Fe_2O_3@PEDOT/Pt catalyst. For example, 4-NA (2 mL, 5 mM) was 10 µmol, considering the conversion is 90%, the moles of 4-NA taking part in the reaction is 9 µmol. Fe_2O_3@PEDOT/Pt (0.1 mL, 0.0001 g/mL) is 10 µg. In addition, considering the molecular weight of Pt (195.084 g/mol) with 10.22 wt.% loading and the reaction time is 14.06 min when the conversion reaches 90%. Therefore, the TOF value with respect of the reduction of 4-NA was calculated to be 7331 h^{-1}.

Table S1. Catalytic performance of different Pt-based catalysts for the reduction of 4-NP and 4-NA.

Reactants	Catalyst	Pt amount (10^{-6} mmol)	k_{app} (min^{-1})	k_{nor} ($min^{-1}mmol^{-1}$)	TOF (h^{-1})	Reference
4-NP	PNIPAM-Pt	9.98	0.014	1402.81	42	[S1]
4-NP	PtNPs@COF	44			51	[S2]
4-NP	CF-RGO-Pt	18			1320	[S3]
4-NP	Pt@OMS	128	0.53	4140.63	834	[S4]
4-NA	Pt/RG	7.02	0.54	76923.08	534	[S5]
4-NP	Fe_2O_3@PEDOT@Pt	5.2	0.05	9615.38	2147	This work
4-NA	Fe_2O_3@PEDOT@Pt	5.2	0.31	59615.38	7331	This work

REFERENCE

[S1] Du, J. T.; Qiao, M.; Pu, Y.; Wang, J. X.; Chen, J. F.; *Appl. Catal., A*, **2021**, 624, 118323.
[S2] Lu, S.; Hu, Y.; Wan, S.; McCaffrey, R.; Jin, Y.; Gu, H.; Zhang, W.; *J. Am. Chem. Soc.*, **2017**, 139, 17082.
[S3] Wang, X.; Liu, D.; Song, S.; Zhang, H.; *Chem. Eur. J.*, **2013**, 19, 5169.
[S4] Liu, X.; Chen, D.; Chen, L.; Jin, R.; Xing, S.; Xing, H.; Xing, Y.; Su, Z.; *Chem. Eur. J.*, **2016**, 22, 9293.
[S5] Raju, M. M.; Pattanayak, D. K.; *RSC Adv.*, **2015**, 5, 59541.

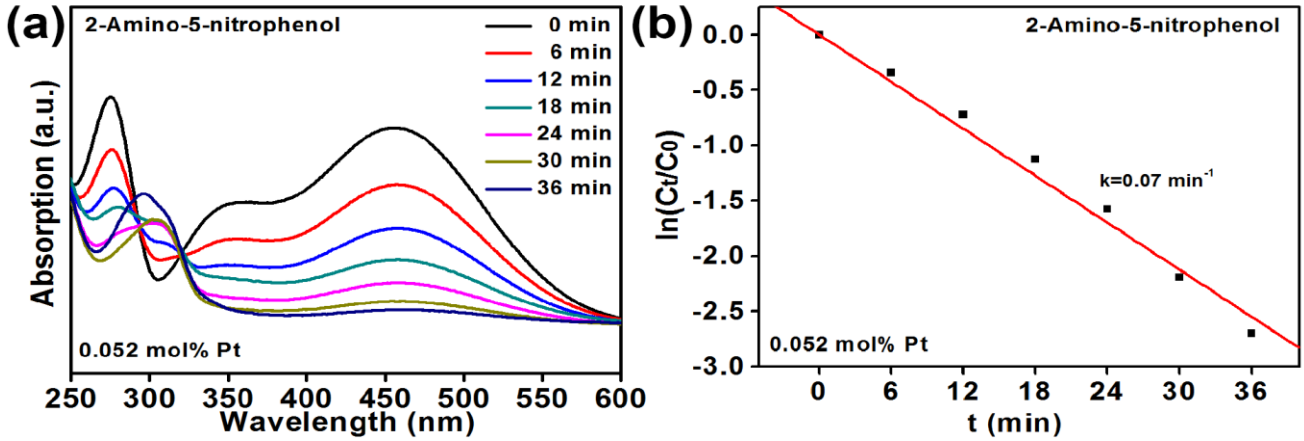

Fig. S1 (a) time-dependent UV-vis spectra of 2-Amino-5-nitrophenol catalyzed by Fe_2O_3@PEDOT/Pt; (b) the plot of $\ln(C_t/C_0)$ against the reaction time (t) for the reduction of 2-Amino-5-nitrophenol.

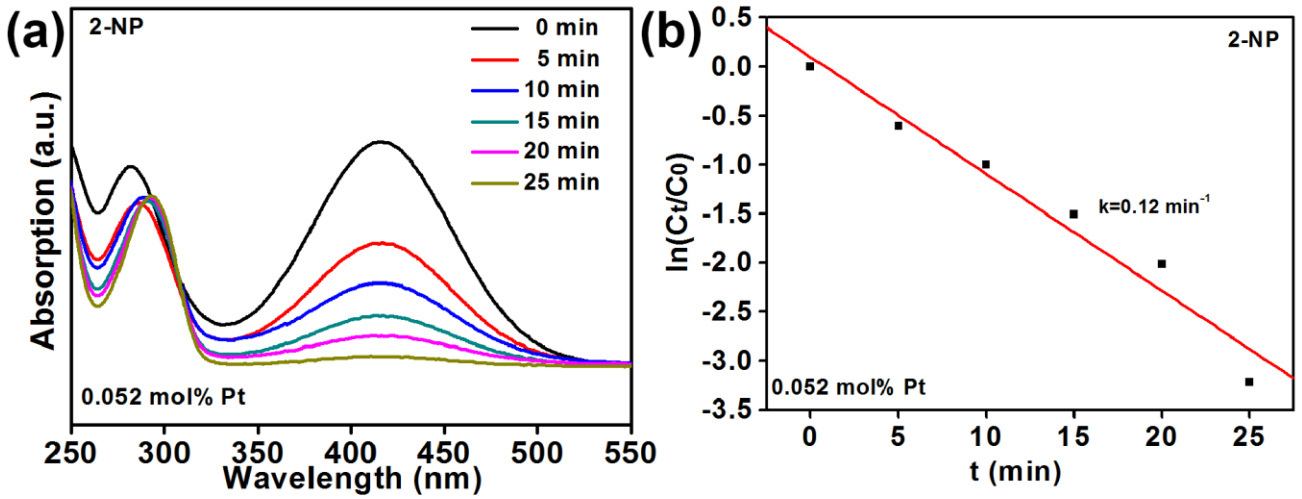

Fig. S2 (a) time-dependent UV-vis spectra of 2-NA catalyzed by Fe_2O_3@PEDOT/Pt; (b) the plot of $\ln(C_t/C_0)$ against the reaction time (t) for the reduction of 2-NA.

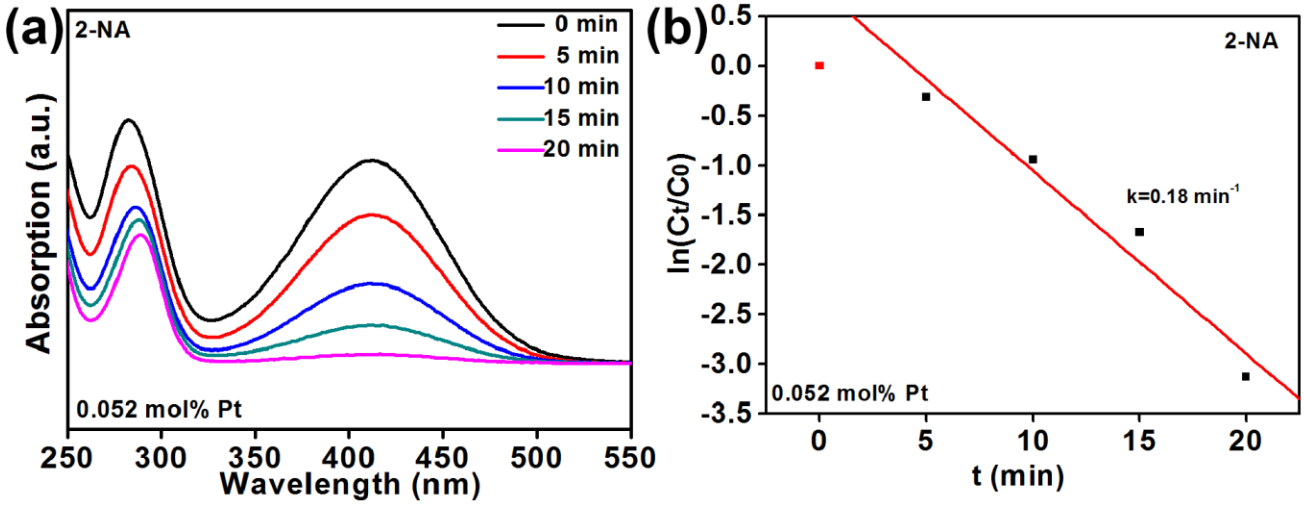

Fig. S3 (a) time-dependent UV-vis spectra of 2-NP catalyzed by Fe_2O_3@PEDOT/Pt; (b) the plot of $\ln(C_t/C_0)$ against the reaction time (t) for the reduction of 2-NP.

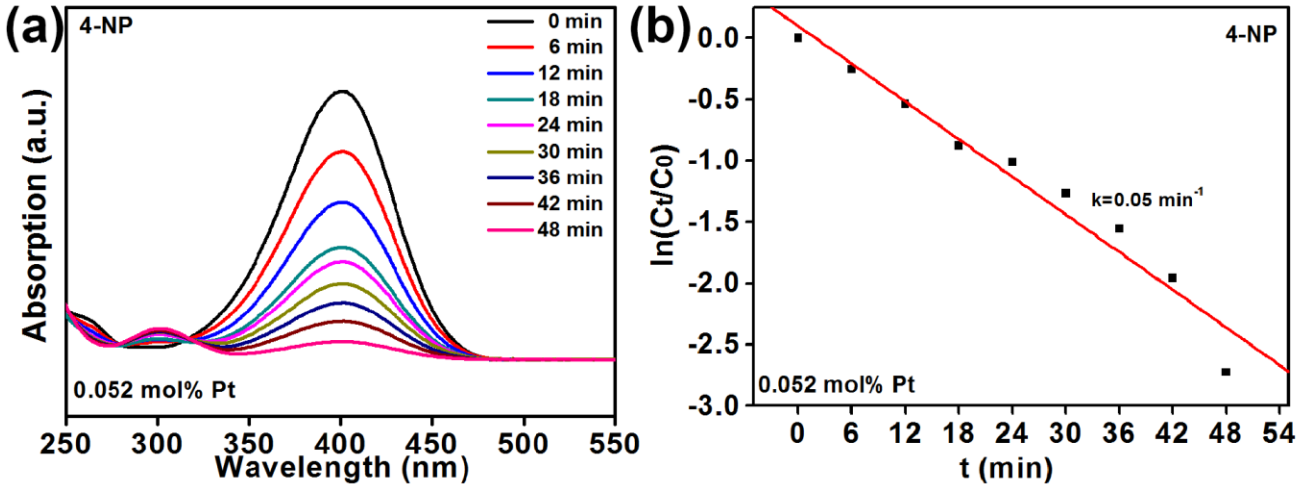

Fig. S4 (a) time-dependent UV-vis spectra of 4-NP catalyzed by Fe_2O_3@PEDOT/Pt; (b) the plot of $\ln(C_t/C_0)$ against the reaction time (t) for the reduction of 4-NP.