# Supporting information

## NIR-accelerated cascade reaction for degradation of organophosphorus compounds by Au/PTE/ZIF-8: Cooperative effect and mechanism

Fang Wang, [ab] Yi Ouyang,[b] Pengfei Zhou,[bc] Yan Zhang,[b] Renjun Gao,*[a] Bekir Engin Eser,*[b] and Zheng Guo*[b]

[a] Key Laboratory for Molecular Enzymology and Engineering, The Ministry of Education, School of Life Science, Jilin University, Changchun 130021, China

[b] Department of Biological and Chemical Engineering, Faculty of Technical Science, Aarhus University, 8000 Aarhus, Denmark

[c] Sericultural & Agri-Food Research Institute, Guangdong Academy of Agricultural Sciences, Key Laboratory of Functional Foods, Ministry of Agriculture and Rural Affairs, Guangdong Key Laboratory of Agricultural Product Processing, Guangzhou, 510610, China

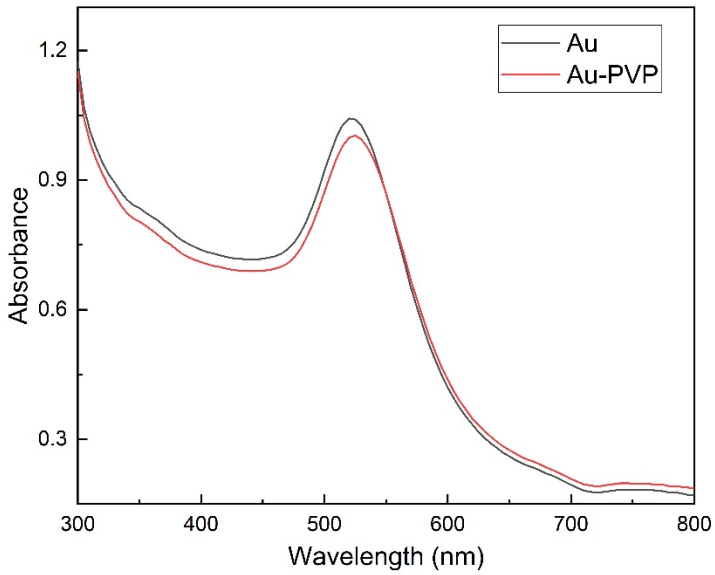


**Fig. S1** UV-VIS absorption spectra of Au and Au-PVP

**Text S1 Calculation of photothermal conversion efficiency**

The temperature change constant can be written as

$$\theta = \frac{T_t - T_0}{T_{max} - T_0} \quad (1)$$

where $T_t$ is the temperature at time t, $T_0$ is the initial solution temperature, and $T_{max}$ is the maximum temperature that the solution can reach under NIR.

To evaluate the heat transfer time constant ($\tau_s$),

$$\tau_s = -\frac{t}{ln\theta} \quad (2)$$

And the heat transfer coefficient is given as

$$h = \frac{\sum_i m_i C_{p,i}}{S\tau_s} \quad (3)$$

where $m$ is the mass of the water, $C_p$ is the heat capacity of the water, $S$ is the surface area of the container, and $m$ is the mass of the water.

The heat released from light absorbed by a container containing pure water ($Q_0$) can be determined by recording the temperature decay profile to the ambient temperature

$$Q_0 = \frac{cm\Delta T}{t} \quad (4)$$

where $\Delta T$ is defined as the temperature change of the solution after turning off the laser, $t$ is the heat

dissipation time of pure water.

Therefore, the photothermal conversion efficiency can be calculated by

$$\eta = \frac{hS(T_{max} - T_0) - Q_0}{P\left(1 - 10^{-A_{808}}\right)} \quad (5)$$

where $P$ is the laser power (2.5 W), $A_{808}$ is the UV absorbance of the solution at 808nm

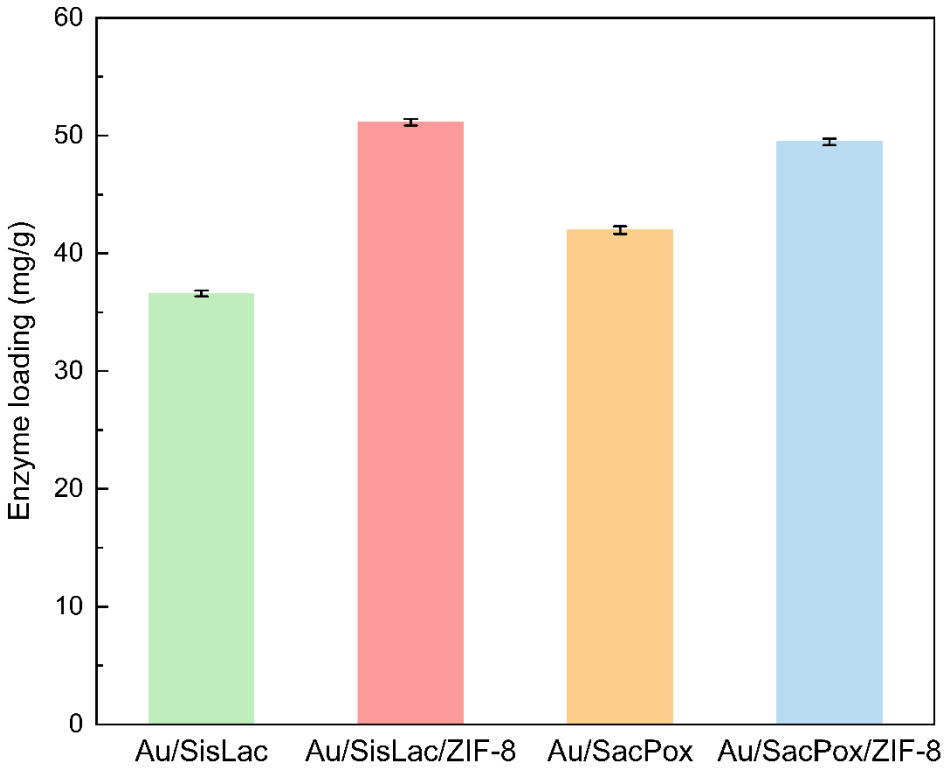


**Fig. S2** The loaded enzymes SisLac and SanPox on different nanomaterials, AuNPs and Au/ZIF-8

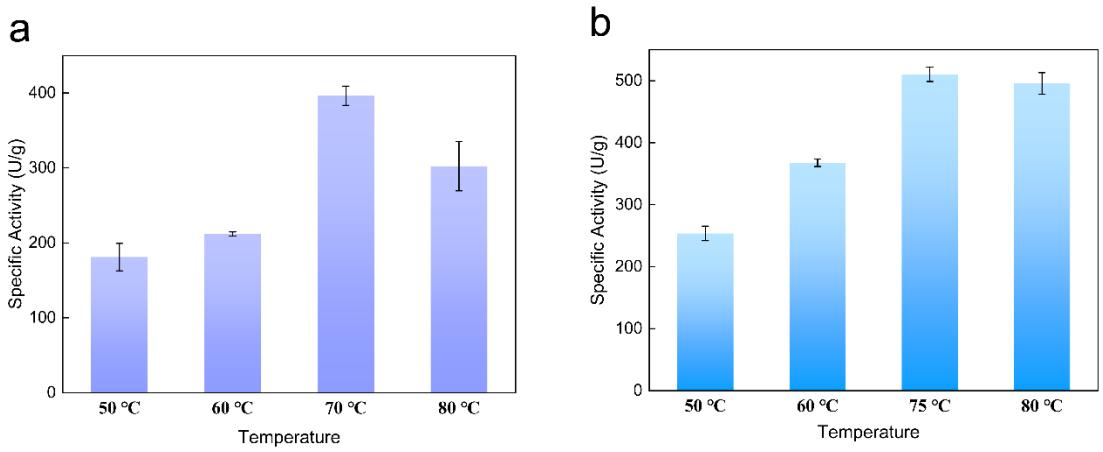


**Fig. S3** (a,b) The specific activity of Au/SisLac/ZIF-8 and Au/SacPox/ZIF-8 at different temperatures

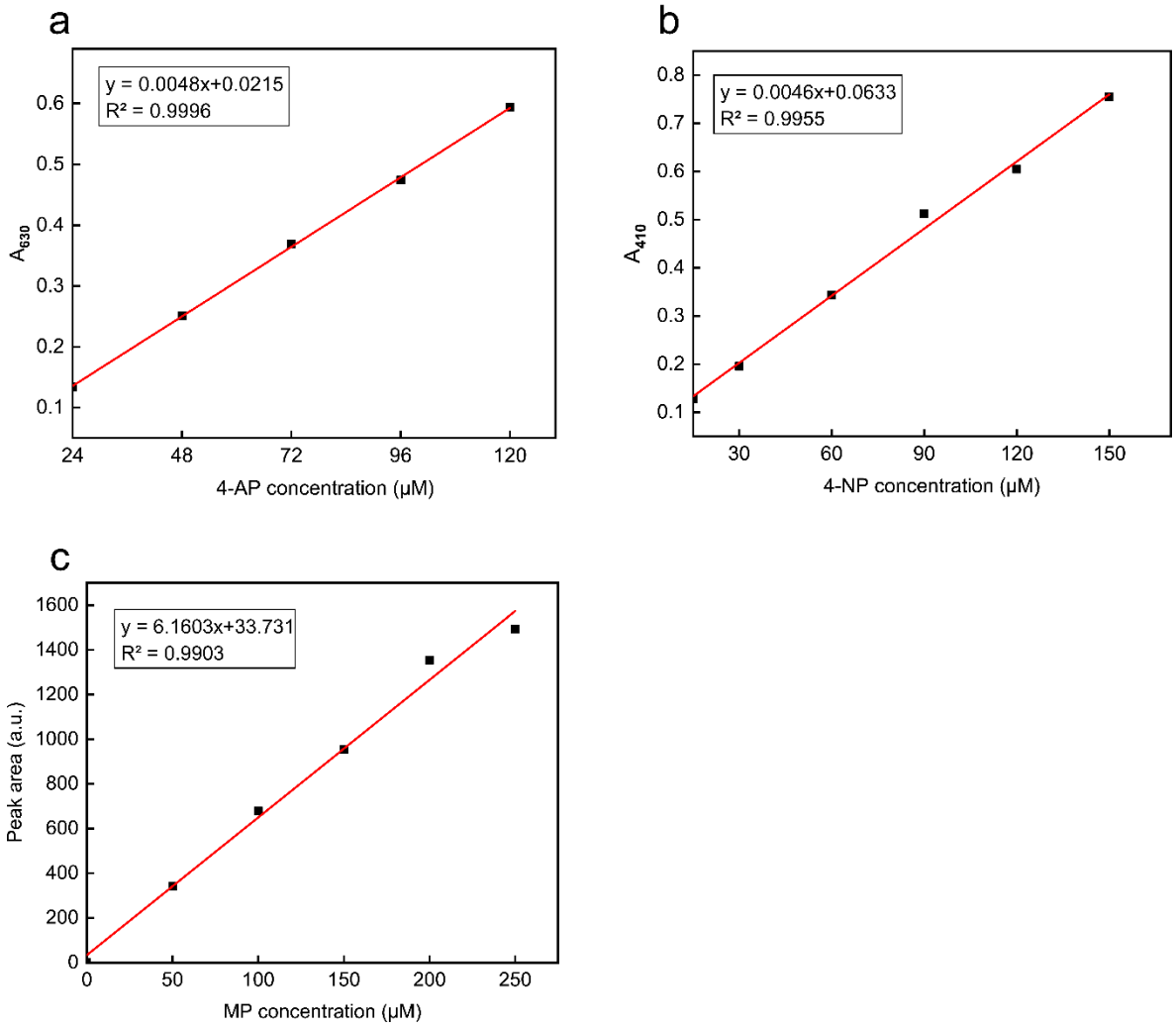


**Fig. S4** The calibration curves of (a) 4-AP, (b) 4-NP and (c) MP. The wavelengths for the spectrophotometry measurement of 4-NP and 4-AP were 410 and 630 nm, respectively. The wavelength for MP detection was 276 nm in the HPLC detection.