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Supporting Information

Heterointegration of Pt/Si/Ag Nanowire Photodiodes and their Photocatalytic Properties

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1. HRTEM and SAED of electrodeposited platinum within the nanoholes of silicon nanowires.

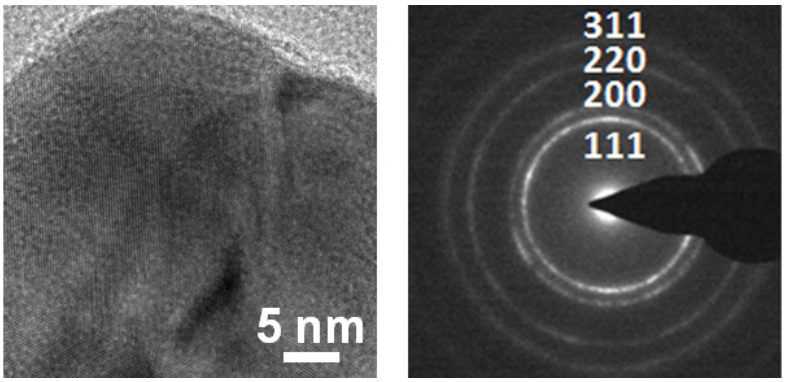

Figure S1. HRTEM and SAED pattern of electrodeposited platinum metal within the nanoholes of silicon nanowires show polycrystalline structure of platinum.

2. Optical Spectrum of the 300 W xenon light and the calculations of quantum efficiency.

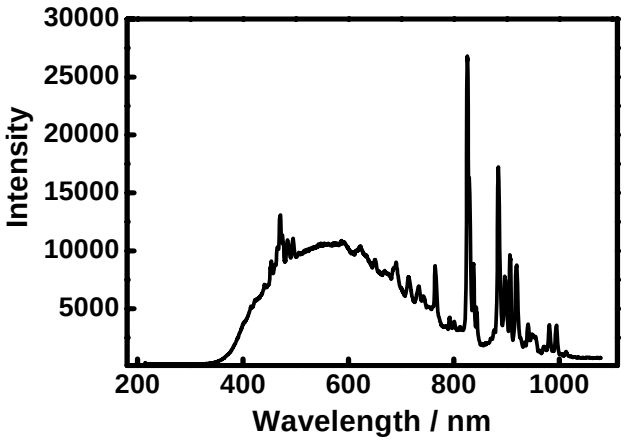

Figure S2. Optical spectrum of the 300 W xenon light used in the photocatalytic reaction. Our reactions are typically carried in pyrex glass beaker with the UV end of xenon light significantly weakened by glass absorption.

The quantum efficiency of the photocatalytic reactions is calculated using:

$$QE = \frac{n \times dN_r / dt}{dN / dt} \times 100\%$$

where dN_r/dt is the number of molecules involved in reaction per nanowire diode in unit time; n is the number of electrons involved for each molecule, and dN/dt is the number of photons absorbed by per nanowire diode per unit time, which can be estimated using the following formula:

$$dN/dt = \int_{200}^{1100} (P_{measure} \times \frac{I_\lambda}{I_{total}}) \times S \times A(\lambda) \times (\lambda / hc) \times d\lambda$$

Where $P_{measure}$ is the input light irradiance; $\frac{I_\lambda}{I_{total}}$ is the power density distribution at wavelength λ; S is the absorption area approximated using the projected area of nanowire (with the average diameter 150 nm and the length 8.0 μm); hc/λ is the energy of photon with a wavelength of λ; $A(\lambda) = 1 - e^{-\alpha(\lambda)d}$ is the absorbance of Si; d is the diameter of nanowire; $\alpha(\lambda)$ is the absorption coefficient of Si. Here the absorption depth is approximated using the diameter of the nanowires.