Supporting information

Site-selective Nanoscale-polymerization of Pyrrole on Gold Nanoparticles via Plasmon Induced Charge Separation

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1. Effects of an ITO substrate on UV-vis spectra of the electrodeposited AuNPs (Fig. 1(e))

A differential extinction peak around 550 nm due to LSPR of AuNPs was observed in Fig. S1(b) which was obtained from Fig. S1(a). The blue-shift of the peak from other samples (Fig. 1(b,c,f)) can be explained that the refractive index of ITO is smaller than that of TiO₂.

![Graphs](image)

Figure S1. (a) UV-vis spectra of an ITO-coated glass plate before and after cathodically electrodeposited AuNPs from 0.2 mg mL⁻¹ aqueous HAuCl₄ on an ITO-coated glass plate at -1.4 V vs. Ag|AgCl for 25 s × 5 times. (b) Differential UV-vis spectrum of the AuNPs on an ITO substrate. Absorbance of the ITO was subtracted from the AuNPs-electrodeposited ITO substrate.
2. Size distribution of the photocatalytically-deposited AuNPs on the TiO$_2$ substrate

AuNPs with various sizes and shapes on a smooth TiO$_2$ substrate were obtained by photocatalytically deposition (Fig. S2). The particle size was calculated from the geometric area of each AuNP in an AFM image.

Figure S2. Diameter histograms ($n = 375$) obtained from an AFM image of AuNPs deposited photocatalytically on the TiO$_2$ substrate with UV light (ca. 50 mW cm$^{-2}$) irradiation in a water/ethanol (v/v=3:2) solution containing 0.2 mM HAuCl$_4$ for 15 min.

3. Absorbance of an aqueous solution containing 10 mM pyrrole

An aqueous solution containing 10 mM pyrrole does not have any significant absorption in the visible region (Fig. S3).

Figure S3. UV-vis spectrum of an aqueous solution containing 10 mM pyrrole
4. Differential extinction spectra of monochromatic light irradiation

When polypyrrole generated at the surface of the resonated AuNPs, the plasmon band specifically shifted to longer wavelength because of the refractive index increment of surrounding medium. Accordingly, each differential extinction spectra exhibited dip and peak ($\lambda_{\text{max}}$ of $\Delta \text{Ext}$) around the wavelength of irradiated light (Fig. S4).

![Figure S4](image.png)

Figure S4. (a) Typical UV-vis spectra of the AuNP-deposited TiO$_2$ substrate before and after irradiation with the monochromatic light in an aqueous solution containing 10 mM pyrrole. (b) Examples of normalized subtracted extinction spectra ($\Delta \text{Ext}$) of the substrate irradiated with the wavelength of 640, 700, 800, 900 and 1000 nm-monochromatic light in an aqueous solution containing 10 mM pyrrole. The dashed lines exhibited the wavelength of the incident light.