Supplementary Information

Label-free electrochemical immunosensor based on ionic organic molecule and chitosan-stabilized gold nanoparticles for the detection of cardiac troponin T

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Synthesis and characterization of ionic organic molecule I-Py

**Fig. S1.** IR spectrum for the ionic product I-Py in KBr.

**Fig. S2.** $^1$H NMR (400 MHz) spectrum for the ionic product I-Py in CDCl$_3$. 
Fig. S3. $^{13}$C NMR (100.6 MHz) spectrum for the ionic product I-Py in CDCl$_3$.

**Thermal Characterization of I-Py**

Fig. S4. Thermal transitions for the compound I-Py determined by DSC using a heating/cooling rate of 10 °C min$^{-1}$ and N$_2$ flow (50 mL min$^{-1}$). The curves correspond to the first cooling and to the second heating scans.
**Fig. S5.** Thermogravimetric analysis (TGA) plot for the ionic product I-Py under N₂ flow (20 mL min⁻¹) with a heating rate of 10 °C min⁻¹.

**Electrochemical behavior of ionic organic molecule I-Py**

\[
\begin{align*}
\text{H}_2\text{C}_{10}\text{O-} & \text{N} & \text{N} & \text{N} & \text{H}_2 & \text{I} & \rightarrow \\
& & & & & & \\
+ (2\text{H}^+, 2\text{e}^-) & \rightarrow \\
- (2\text{H}^+, 2\text{e}^-) & \\
\text{H}_2\text{C}_{10}\text{O-} & \text{N} & \text{N} & \text{N} & \text{H} & \text{N} - & \text{I} \,
\end{align*}
\]

**Fig. S6.** Proposed chemical equation for the redox process of I-Py.

Figure S7-A shows the influence of the scan rate (ν) on the voltammetric profile for the I-Py modified electrode in phosphate buffer solution (pH 7.0, 0.1 mol L⁻¹). The scan rate was varied from 10 to 300 mV s⁻¹. The reaction is quasi-reversible because the potentials shifted with increasing scan rate. In addition, the cathodic current-iₚc anodic current-iₚa ratio deviated slightly from 1.0. The currents of both peaks changed linearly with the square root of the scan rate (Fig. S7-B). The corresponding linear regression equations are

\[
i_{\text{pa}} / \mu\text{A} = -1.09 + 0.65 \nu^{1/2} / (\text{mV s}^{-1})^{1/2} (r^2 = 0.998)
\]

and

\[
i_{\text{pc}} / \mu\text{A} = 1.47 - 0.87 \nu^{1/2} / (\text{mV s}^{-1})^{1/2} (r^2 = 0.990).
\]

These results indicate that the redox reaction of I-Py is a diffusion-controlled process. Moreover, the plot of log iₚ vs. log ν (Fig. S7-C) exhibited a slope of 0.65 for the oxidation reaction and 0.87 for the reduction reaction, clearly indicating that the current for both reactions was diffusion-controlled with a contribution from adsorption.
Fig. S7. (A) Cyclic voltammograms for I-Py sensor in 0.1 mol L⁻¹ phosphate buffer (pH 7.0), $v = 10$ a 300 mV s⁻¹; (B) plot $i_p$ vs. $v^{1/2}$; (C) plot log $i_p$ vs. log $v$. 
**Fig. S8.** UV-vis spectra of the CTS-stabilized AuNP (A) before and (B) after addition of anti-cTnT.