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Supplementary material to

Sm/UiO-66 metal organic framework modified electrode for the electrochemical determination of ethambutol hydrochloride in pharmaceutical formulations and human urine

Pham Thi Huyen Thoa[1,2], Nguyen Quang Man[3], Phan Tu Quy[2], Nguyen Chi Bao[4], Le Van Thanh Son[5], Le Lam Son[1], Dao Ngoc Nhiem[6] and Dinh Quang Khieu[1]

[1]*University of Sciences, Hue University, Vietnam*
[2]*Department of Natural Sciences & Technology, Tay Nguyen University, Vietnam*
[3]*University of Medicine and Pharmacy, Hue University, Vietnam*
[4]*Department of Science, Technology and International Relations, Hue University, Vietnam*
[5]*University of Education and Technology, The University of Danang, Vietnam*
[6]*Institute of Materials Science, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet Street, Nghia Do, Hanoi, Vietnam*

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Figure S1 illustrates how the accumulation potential affects the DPV response of Sm/UiO-66(3/100)/GCE for 25.0 µM ETB in 0.1 M BRS (pH 4). As shown in Figure S1A, the oxidation peak current changes only slightly when the accumulation potential varies from −0.6 to +1.2 V, while the peak potential stays nearly the same. The Ip values in Figure S1B indicate relatively stable currents from −0.6 to +0.8 V, then decreases at more positive potentials (≥ +1.0 V). Although similar responses are seen at various potentials, 0.0 V was chosen for further experiments due to its more stable and reproducible signal.

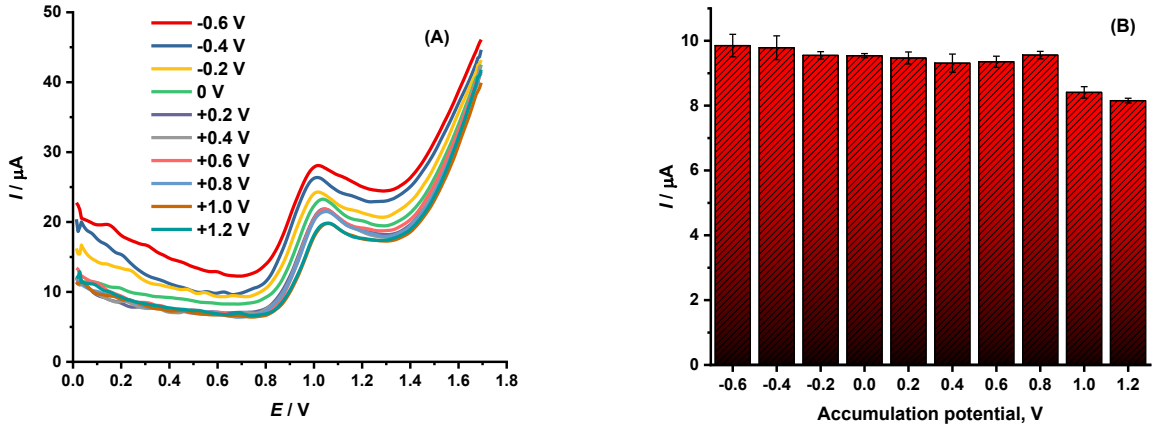

Figure S1. *(A) DPV curves of Sm/UiO-66(3/100)/GCE recorded in 0.1 M BRS (pH 4) containing 25.0 µM ETB and (B) I_p values at different accumulation potentials. (Accumulation time: 4 s; pulse amplitude: 0.07 V; voltage step: 0.007 V)*

As shown in Figure S2, the peak current rises sharply from 0 to 4 s, indicating quick accumulation of ETB on the Sm/UiO-66(3/100)/GCE surface. After 4 s, the signal shows only small fluctuations and begins to level off, suggesting that the electrode surface nears adsorption saturation. Extending the accumulation time beyond this point does not significantly increase the current response. Therefore, 4 s was chosen as the optimal accumulation time to ensure high sensitivity while keeping the analysis brief.

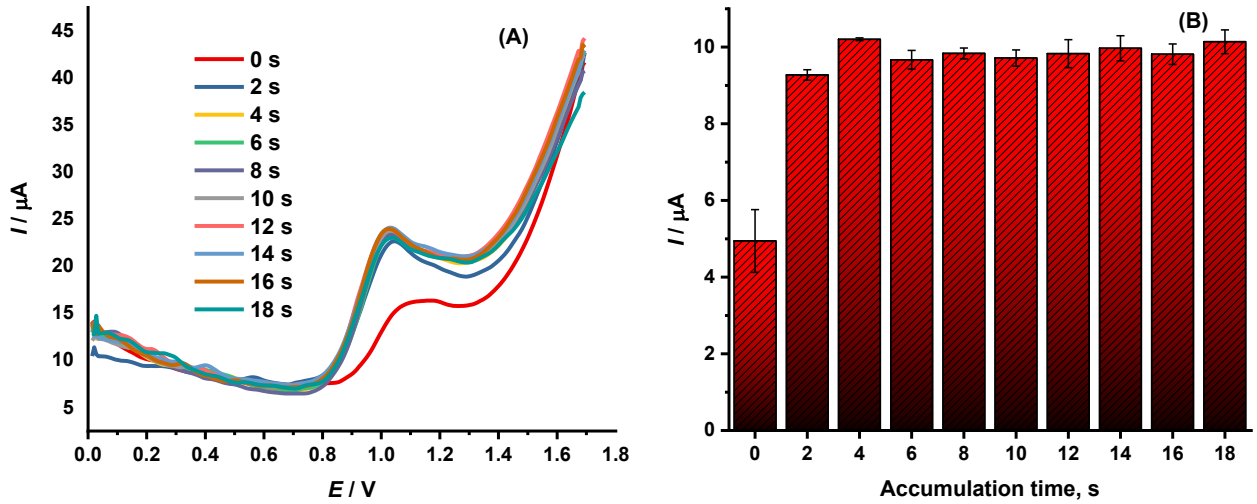

Figure S2. *DPV curves of Sm/UiO-66(3/100)/GCE recorded in 0.1 M BRS (pH 4) containing 25.0 µM ETB and (B) I_p values at different accumulation times (Accumulation potential: 0 V; pulse amplitude: 0.07 V; voltage step: 0.007 V)*

As illustrated in Figure S3, the peak current increased progressively as the pulse amplitude was raised from 0.05 to 0.10 V, indicating enhanced signal sensitivity. The maximum current response was obtained at 0.10 V. Further increasing the pulse amplitude to 0.11 to 0.12 V did not produce a significant improvement and may slightly affect peak shape or stability. Therefore, a pulse amplitude of 0.10 V was selected as the optimal condition for subsequent measurements, providing a strong and stable analytical signal.

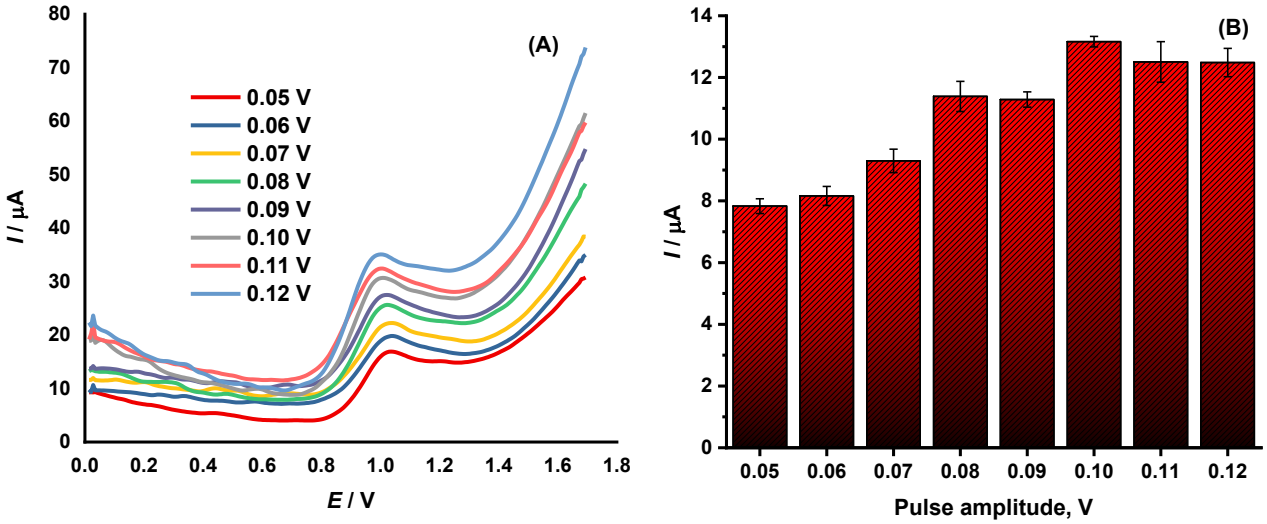

Figure S3. *DPV curves of Sm/UiO-66(3/100)/GCE recorded in 0.1 M BRS (pH 4) containing 25.0 µM ETB and (B) I_p values at different pulse amplitudes (Accumulation potential: 0 V; accumulation time: 4 s; voltage step: 0.007 V)*

As shown in Figure S4, the peak current gradually increased as the voltage step was raised from 0.004 to 0.008 V, indicating enhanced signal intensity and improved sensitivity of the DPV response. This increase can be attributed to the larger potential increment, which promotes a higher faradaic current contribution. However, when the voltage step was further increased to 0.009 to 0.010 V, the current showed only a slight improvement and tended to level off, suggesting that the signal reached a stable value. Considering both signal enhancement and measurement stability, a voltage step of 0.008 V was chosen as the optimal condition for subsequent experiments.

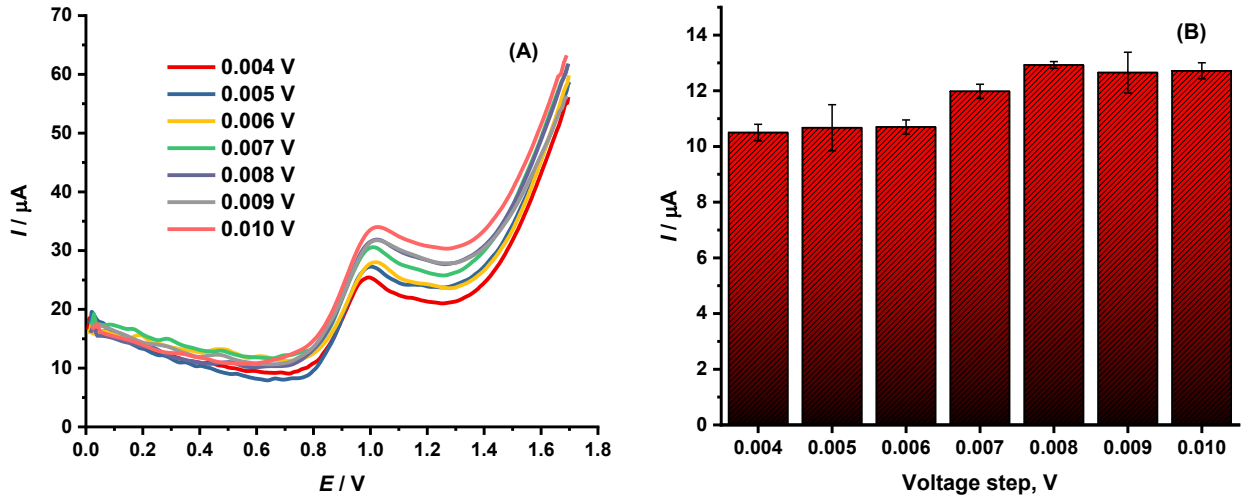

Figure S4. *DPV curves of Sm/UiO-66(3/100)/GCE recorded in 0.1 M BRS (pH 4) containing 25.0 µM ETB and B) I_p values at different voltage steps (Accumulation potential: 0 V, accumulation time: 4 s, pulse amplitude: 0.10 V)*

The repeatability of the proposed method was assessed by measuring ETB at five concentrations (2.5 to 29.1 µM), with 10 consecutive DPV replicates for each concentration (Figure S5). The resulting RSD values were compared with ½RSD_H to evaluate precision.

At all concentrations, the RSD values for Sm/UiO-66/GCE were lower than ½RSD_H. For example, at 2.5 µM, the RSD was 3.3 %, markedly lower than the predicted ~8.5 %. At higher concentrations (19.6 and 29.1 µM), the RSD decreased to below 1.5 %, confirming good repeatability.

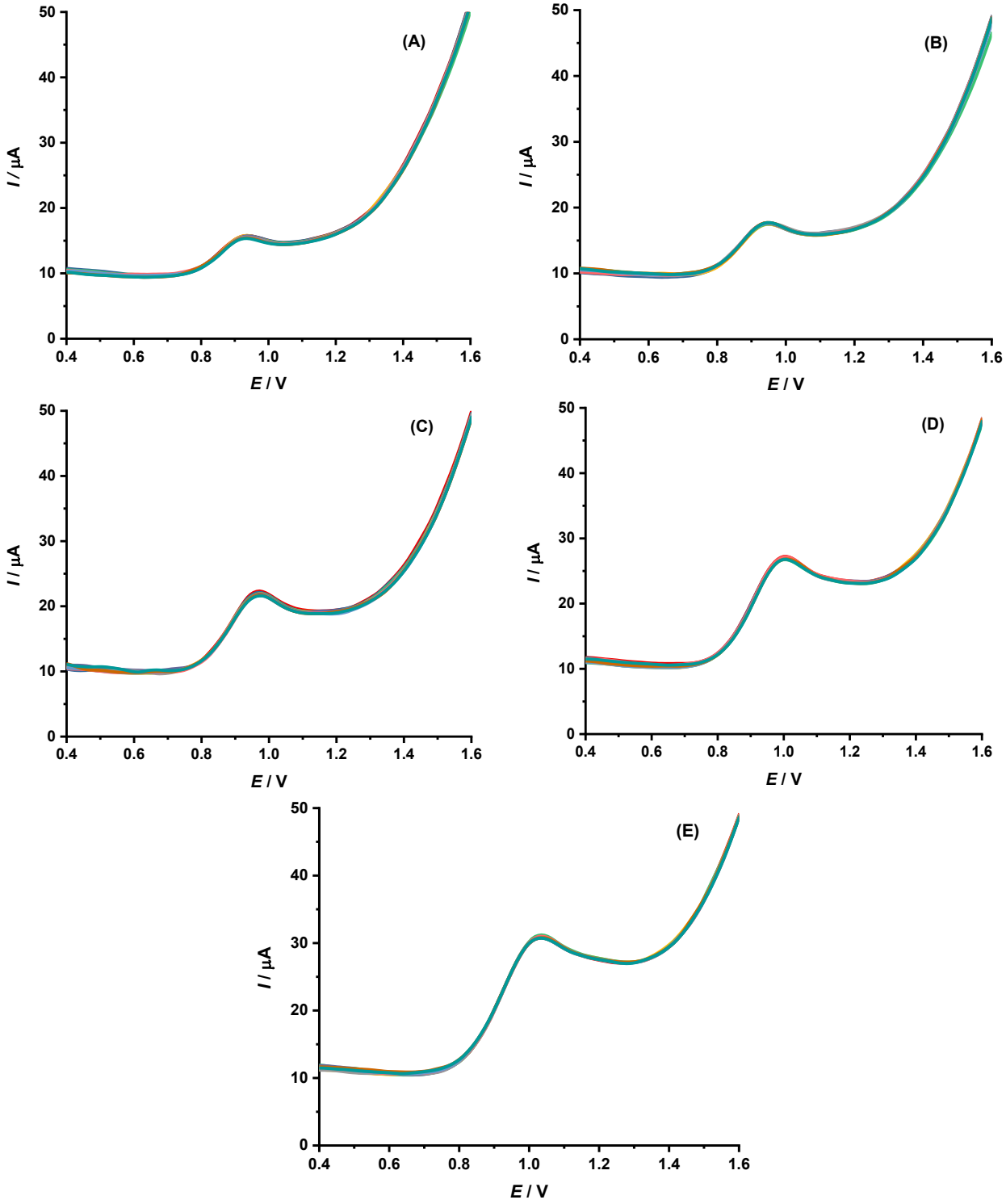

Figure S5. *DPV curves of Sm/UiO-66(3/100)/GCE recorded in 0.1 M BRS (pH 4) containing ETB at concentrations of A) 2.5; B) 5; C) 10; D) 20 and E) 30 µM*