Efficient Electrochemical Detection of Cancer Cells on in-situ Surface-Functionalized MoS₂ Nanosheets

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Fig. S1 TGA curve of bare thiourea (TU), showing an obvious weight loss from 175 to 245°C associated with TU decomposition.
Fig. S2 AFM image of TU-MoS$_2$.

Fig. S3 (a) SEM and (b) HR-TEM images of bare MoS$_2$ after removing TU by H$_2$SO$_4$ treatment. After the treatment with 0.05 M H$_2$SO$_4$ at 150 °C, the bare MoS$_2$ nanosheets are finally received. The SEM image of MoS$_2$ (Figure S3a) identifies the nanosheet-like morphology similar with TU-MoS$_2$. The HR-TEM (Figure S3b) shows the visible lattice fringe of 0.27 nm indexed as the (100) or (010) of hexagonal MoS$_2$, and an interlayer spacing of 0.62 nm corresponding to MoS$_2$(002).
Fig. S4 XPS profiles of N 1s in TU-MoS$_2$ and thiourea (TU).

Fig. S5 XPS profiles of Mo 3d and S 2p in TU-MoS$_2$ and bare MoS$_2$, showing the coincident peaks of Mo 3d$_{3/2}$, Mo 3d$_{5/2}$, S 2p$_{1/2}$, and S 2p$_{3/2}$ in the both tow samples. The similar chemical environment of Mo and S is reasonably indicated in TU-MoS$_2$ and MoS$_2$. 
**Fig. S6** Reproducibility of GE11/TU-MoS$_2$/GCEs biosensor for the repeated three tests with different HepG2 concentration.

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**Table S1** Comparison of different cytosensor material for HepG2 cell detection.

<table>
<thead>
<tr>
<th>Method</th>
<th>cytosensor material</th>
<th>Linear range [cells mL$^{-1}$]</th>
<th>Detection limit [cells mL$^{-1}$]</th>
<th>Ref.</th>
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<tbody>
<tr>
<td>Electrochemical impedance spectroscopy</td>
<td>TU-MoS$_2$ nanosheets</td>
<td>50 - 2.0×10$^6$</td>
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<td>This work</td>
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<td>Differential pulse voltammetry</td>
<td>G-quadruplex/hemin /aptamer–AuNPs–HRP</td>
<td>1.0×10$^2$–1.0×10$^7$</td>
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<tr>
<td>ICP-MS</td>
<td>CdSe/ZnS QDs</td>
<td>200-3×10$^4$</td>
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<td>Electrochemiluminescence</td>
<td>TiO$_2$/CdS</td>
<td>400 – 1.0×10$^4$</td>
<td>396</td>
<td>[3]</td>
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<tr>
<td>Electrochemiluminescence</td>
<td>ZnO@CdS nanorods</td>
<td>3.0×10$^2$–1.0×10$^4$</td>
<td>256</td>
<td>[4]</td>
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<tr>
<td>Atomic force microscope</td>
<td>Au microcantilever</td>
<td>1.0×10$^3$-1.0×10$^5$</td>
<td>300</td>
<td>[5]</td>
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