

Figure S1. SEM image of $\text{NH}_2\text{-VMSF/ITO}$ before (a) and after electrochemical deposition Au nanomaterial for 5s (b) (B) SEM image of $\text{Au@NH}_2\text{-VMSF/ITO}$ prepared using electrochemical deposition of Au nanomaterial for 60s (c).

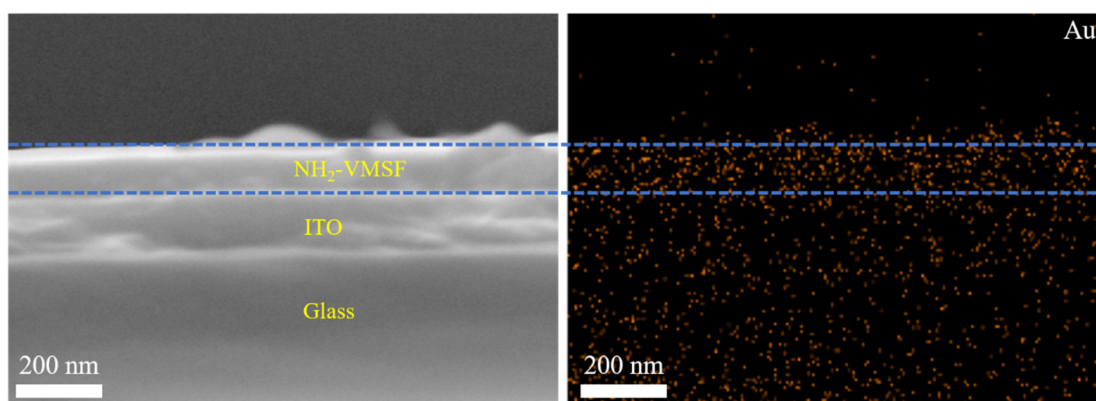


Figure S2. The cross-sectional SEM (left) and corresponding elemental mapping (right) images of the $\text{Au@NH}_2\text{-VMSF/ITO}$ electrode, fabricated *via* 5-second electrodeposition of Au nanomaterials.

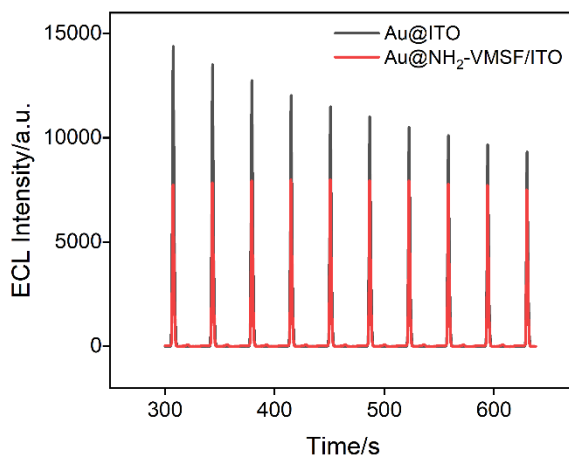


Figure S3. The time-dependent ECL signal curves obtained from continuous measurements on different electrodes.

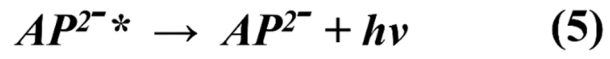
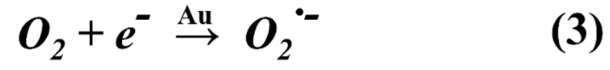
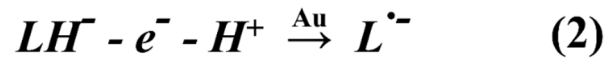


Figure S4. The possible ECL mechanism of the luminol-O₂ system constructed in this study.