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Supporting Information

Growth of large-scale MoS_2 nanosheets on double layered $ZnCo_2O_4$ for real-time *in-situ* H_2S monitoring in live cells

Veerappan Mani[1,2],* Shanthi Selvaraj[3,4], Nithiya Jeromiyas[1], Sheng-Tung Huang[1], Hiroya Ikeda[4], Yasuhiro Hayakawa[4], Suru Ponnusamy[3], Chellamuthu Muthamizhchelvan*[3], Khaled Nabil Salama[2]*

[1]*Institute of Biochemical and Biomedical Engineering, Department of Chemical Engineering and Biotechnology, National Taipei University of Technology, Taipei 106, Taiwan (ROC)*

[2]*Sensors Lab, Advanced Membranes and Porous Materials Center, Computer, Electrical and Mathematical Science and Engineering Division, King Abdullah University of Science and Technology (KAUST), Saudi Arabia*

[3]*Centre for Nanoscience and Nanotechnology, Department of Physics and Nanotechnology, SRM University, India.*

[4]*Research Institute of Electronics, Shizuoka University, 3-5-1 Johoku, Naka-ku, Hamamatsu, Japan.*

*Corresponding authors: veerappan.mani@kaust.edu.sa (V. Mani), selvancm@gmail.com (C. Muthamizhchelvan), khaled.salama@kaust.edu.sa (K.N. Salama)

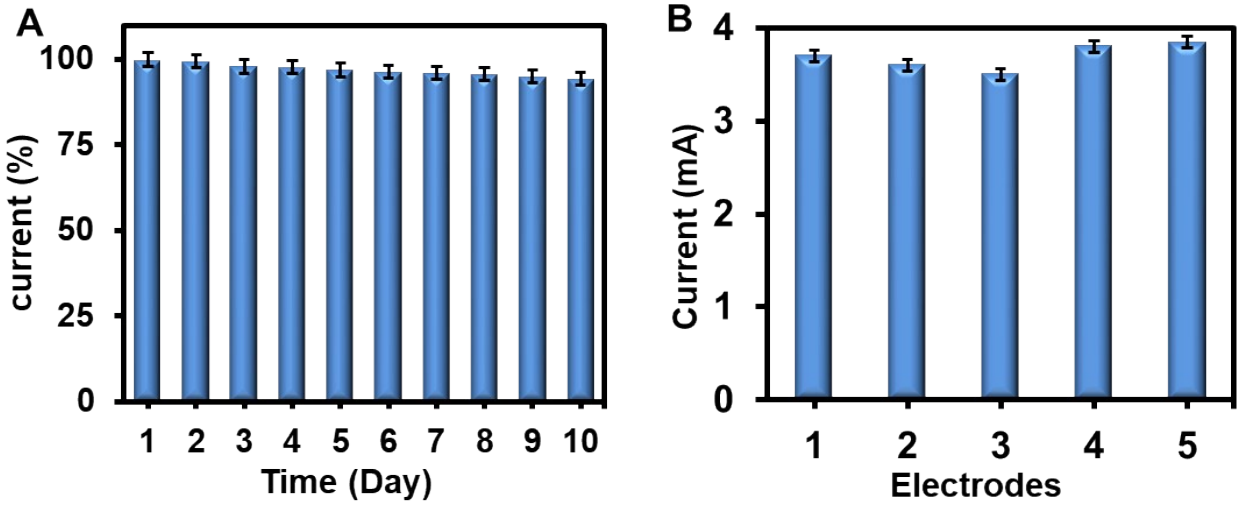

Figure S1 (A) H_2S sensing performance of MoS_2–$ZnCo_2O_4$–$ZnCo_2O_4$/CC for 10 continuous days (stability test) and (B) Reproducibility of five MoS_2–$ZnCo_2O_4$–$ZnCo_2O_4$/CC. The experiments were performed toward 1 mM H_2S suspended in 0.1 M PBS (pH 7.4).

Effect of concentration

As the concentration of H_2S increases, the oxidation peak current was also increased (**Figure S2A**). The linear increase in the peak currents upon succession injection of increasing amounts of H_2S was witnessed, suggesting the absence of electrode fouling. Anti-fouling surface is an important requirement for the electrode to be used in *real-time* sensing, because the electrode must be in contact with the solution for a continuous period. The plot between response current and concentration of H_2S exhibits good linearity (**Figure S2B**). The linear regression equation is, current (μA) = 0.0173 [H_2S] (μM) + 0.0062.

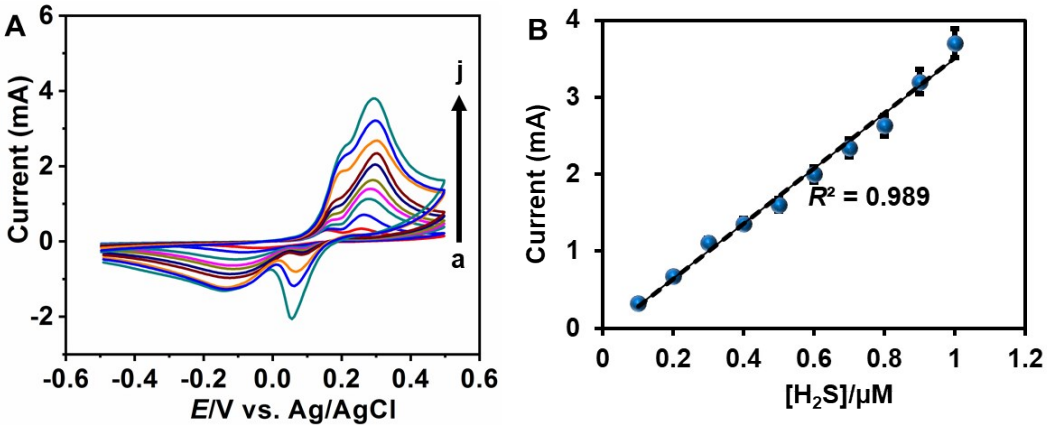

Figure S2 (A) CVs of MoS_2–$ZnCo_2O_4$–$ZnCo_2O_4$/CC toward different concentrations of H_2S (a= 0.1 mM, b = 0.2 mM, c = 0.3 mM, d = 0.4 mM, e = 0.5 mM, f = 0.6 mM, g = 0.8 mM, h = 0.7 mM, i =0.9 mM, and j =1 mM) dispersed in PBS (pH 7.4). (B) Plot of peak current (mA) vs. [H_2S]/µM.

Effect of scan rate

Next, the effect of scan rate on the electrocatalysis of H_2S was analyzed by applying different scan rates from 0.01–0.1 Vs^{-1} (**Figure S3A**). The plot between H_2S reduction peak currents and square root of scan rate displays good linearity, suggesting a diffusion controlled reaction (**Figure S3B)**. The linear regression equation is, current (mA) = 7.193 $(\text{scan rate})^{1/2}\,(V.s^{-1})^{1/2}$ – 0.763

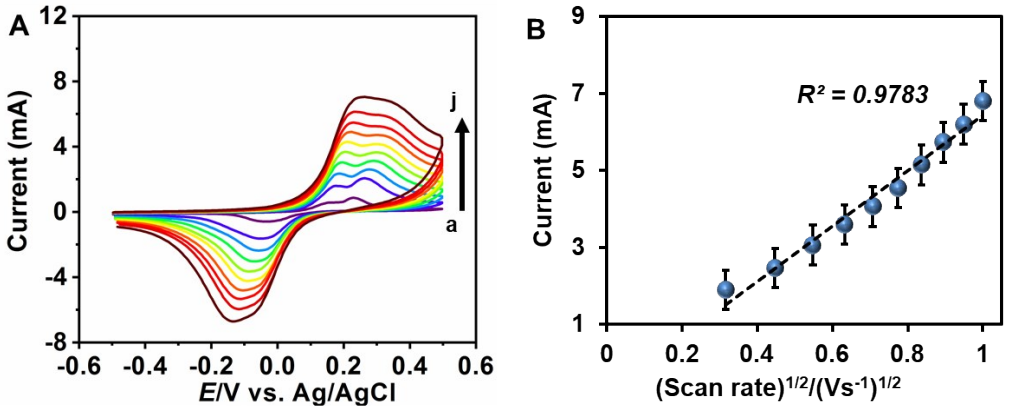

Figure S3 (A) CVs recorded for different scan rates at MoS_2-$ZnCo_2O_4$-$ZnCo_2O_4$/CC toward 1 mM H_2S suspended in PBS (pH 7.4) and (B) respective plot of peak current (µA) vs. $(\text{scan rate})^{1/2}\,(V.s^{-1})^{1/2}$.

Effect of pH

The influence of pH was examined by recording the CV responses of MoS_2–$ZnCo_2O_4$–$ZnCo_2O_4$/CC toward 1 mM H_2S at different pH (4.4 to 9.4) (**Figure S4A**). A significant change in the H_2S anodic peak potential (**Figure S4B**) and peak current (**Figure S4C**) have been observed upon changes in pH of the electrolyte. Lowest current response was observed at

pH 4.4, a gradual enhancement was observed from 4.4 to 7.4 before reaching maxima at 7.4. From 7.4 to 9.4, a steady decline in the peak current was observed. Thus, pH 7.4 was the optimum pH for maximum H_2S sensing performance.

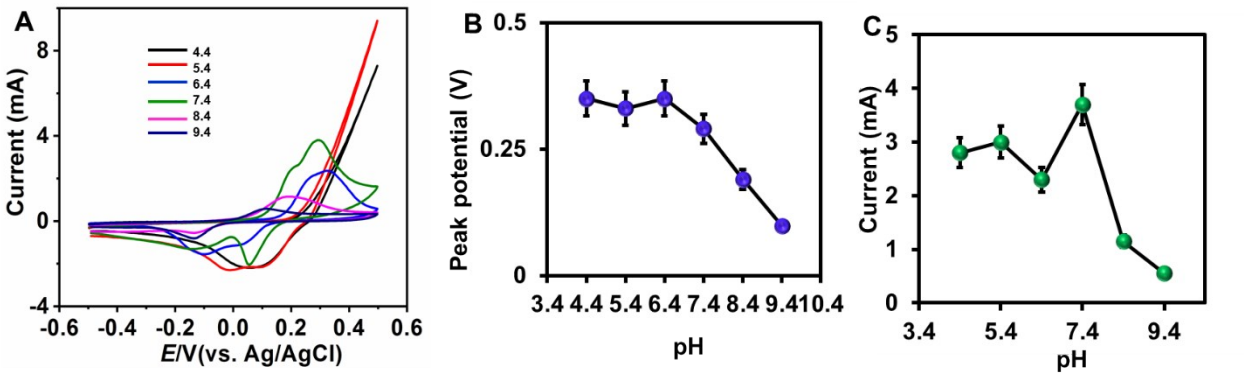

Figure S4 (A) CV responses of MoS_2-$ZnCo_2O_4$-$ZnCo_2O_4$/CC for 1 mM H_2S suspended in an electrolyte of different pH values; a) 4.4, b) 5.4, c) 6.4, d) 7.4, e) 8.4, and f) 9.4 and (B) corresponding plot for peak potential (V) vs. pH, (C) peak current (mA) vs. pH.

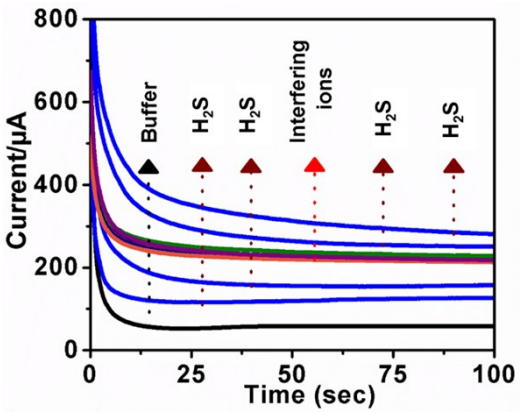

Figure S5 Selectivity of MoS_2–$ZnCo_2O_4$–$ZnCo_2O_4$/CC: Amperometric experiments were conducted toward 100 μM H_2S and 250 μM of homocysteine, cysteine, $Na_2S_2O_3$, glutathione, H_2O_2, dopamine, ascorbic acid, uric acid, Na_2SO_3, $Na_2S_2O_4$, NO_2^-, and NO in PBS, pH 7.4.

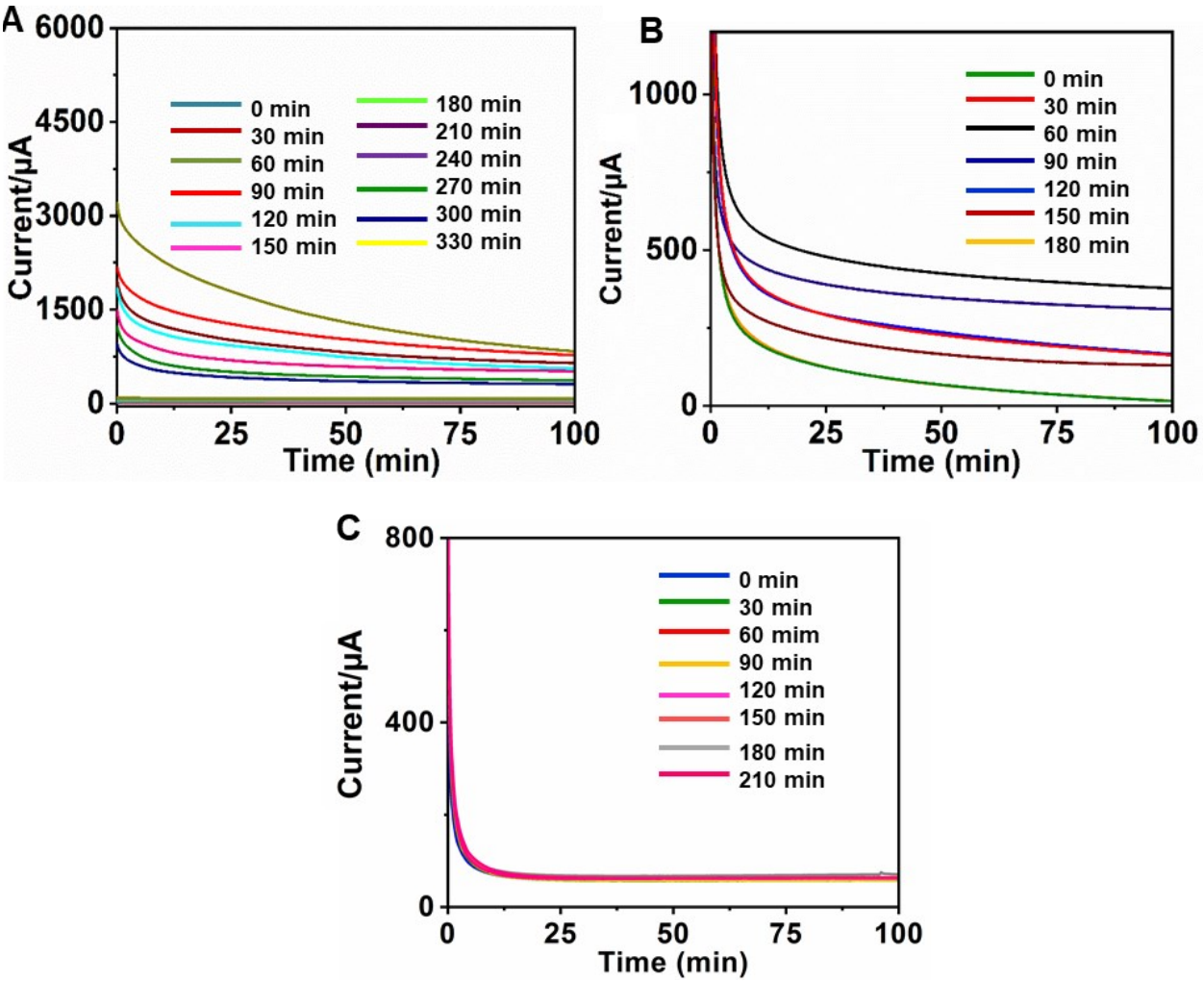

Figure S6 Chronoamperometric curves for real-time H_2S monitoring, (A) stimulated by 1 mM cysteine, (B) stimulated by 1 mM cysteine + 10 mM aspartate and (C) no stimulation.