Supporting Information File

Studies on Glutathione coated hollow ZnO modified Glassy Carbon Electrode; A novel Pb(II) selective electrochemical sensor

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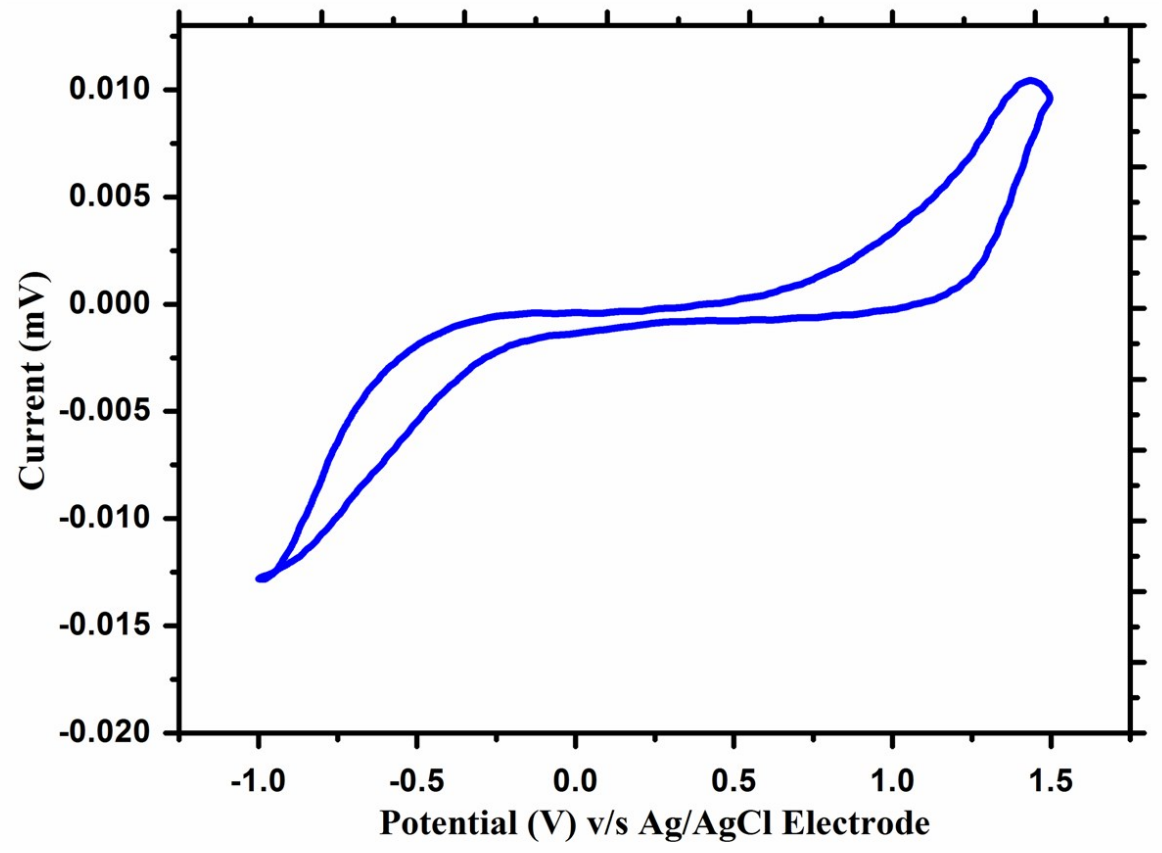

Fig. S1 Cyclic Voltammogram of Glu-h-ZnO/GCE in a solution of 0.1M KNO_3 at a scan rate of 0.05mV/s (v/s Ag/AgCl electrode)

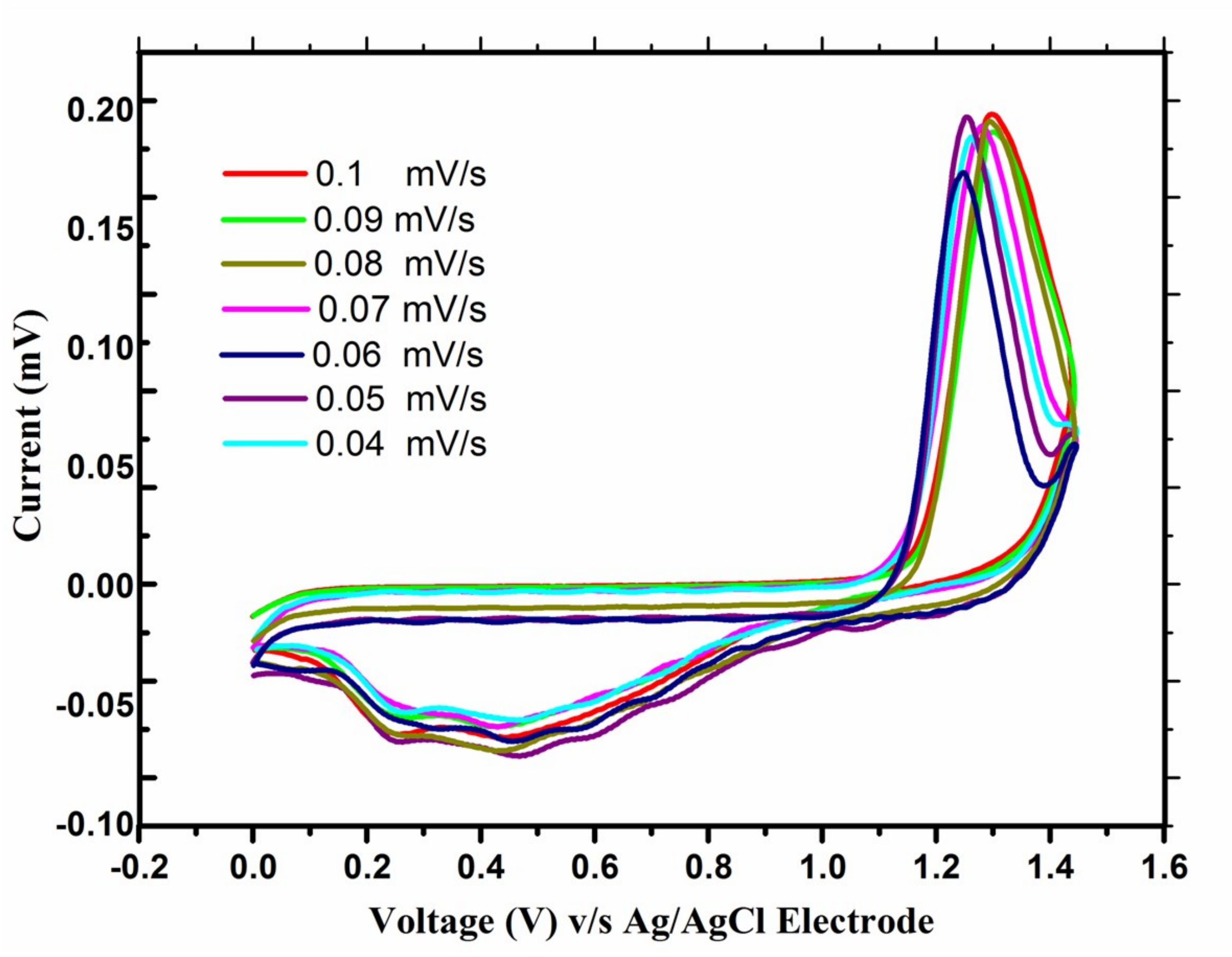

Fig. S2 Cyclic voltammograms of Glu-h-ZnO/GCE for 10^{-3} M Pb(II) solution in 0.1M KNO_3 at different scan rates (0.04 to 0.1 mV/s) (v/s Ag/AgCl electrode).

S3: Linear sweep voltammetric (LSV) measurements:

In order to optimize the system, we first recorded the LSV scan of solution, containing the electrolyte only, in the potential window of 0 to 1.5 V and the results indicate that there is no interference due to modified GCE while performing electrochemical detection of metal ions (Fig. 1).

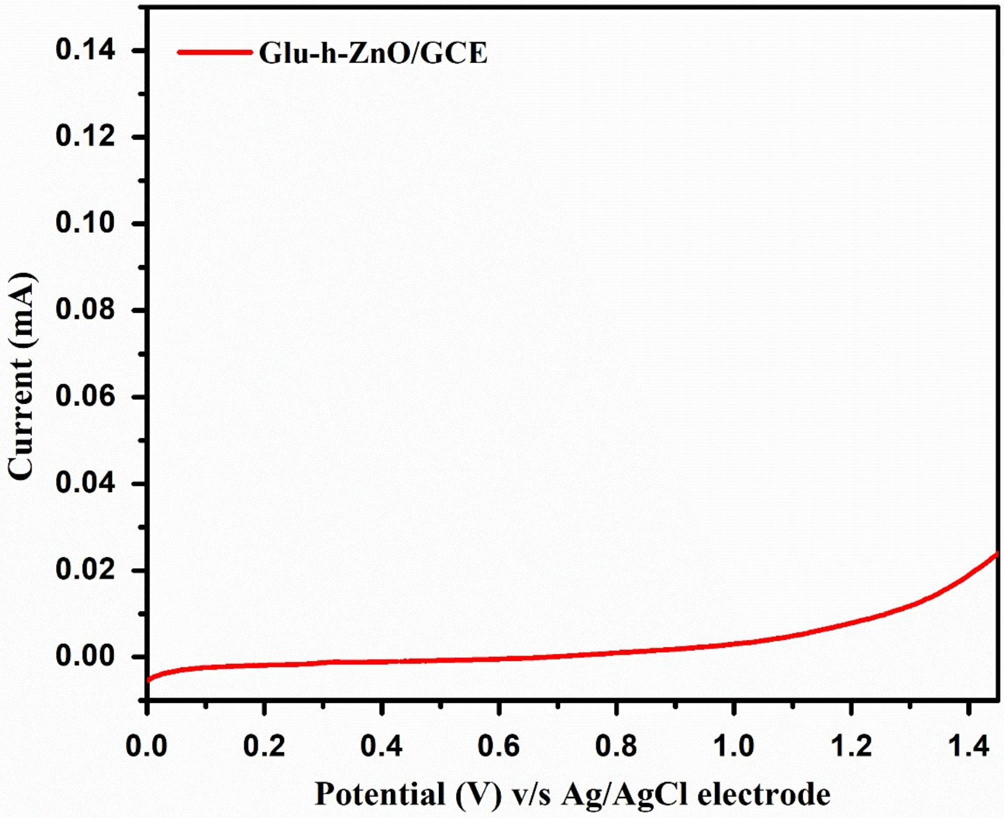

Fig. 1 Linear sweep voltammogram of Glu-h-ZnO/GCE in 0.1M KNO_3 at a san rate of 0.05mV/s (v/s Ag/AgCl electrode).

Besides, no peak of response for any of the test metal ions in the selected potential window was observed with unmodified GCE in comparison to modified electrode (Fig. 2).

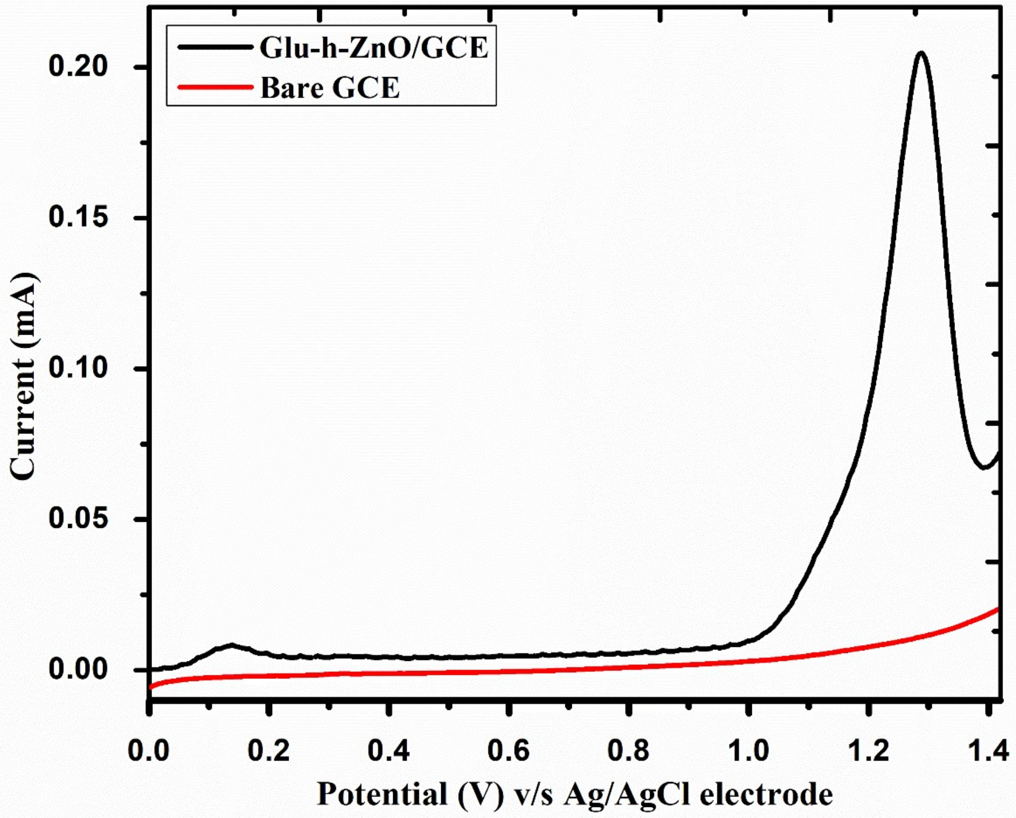

Fig. 2 Linear sweep voltammograms of bare and Glu-h-ZnO/GCE for a mixture of equi-molar solution of Pb(II), Hg(II) and Cd(II) ions in 0.1M KNO_3 at a san rate of 0.05mV/s (v/s Ag/AgCl electrode).

In order to check the selective response of the Glu-h-ZnO/GCE, LSV scan in the selected potential window of 0 to 1.5 V, was carried out for the solution containing equi-molar (10^{-3}M) concentrations of Pb(II), Hg(II) and Cd(II) ions (Fig. 3a). However, the resulted voltammograms depict only two well distinguished peaks which correspond to Hg(II) and Pb(II) ions, respectively. The peak due to Cd(II) is missing in the voltammograms and the peak corresponding to Hg(II) is of very low intensity and slightly shifted to lower potential compared to that observed in CV experiments. On the other hand, the peak corresponding to Pb(II) is very sharp and highly intense which indicate that the electrode is highly selective for Pb(II) ion. The highly selective response of Pb(II) and lower sensitivity of the LSV technique may be the reason for the lowering in the intensity of the peak corresponding to Hg(II) and Cd(II) ions and the effect seems to be more pronounced for Cd(II) which ultimately leads to its disappearance in the voltammogram. In view of best electrochemical response of Pb(II) ion, further LSV measurements were carried for the different Pb(II) ion concentrations (1 μM to 100 μM) at the optimized conditions and I-V curves for each concentration was recorded (Fig. 3b).

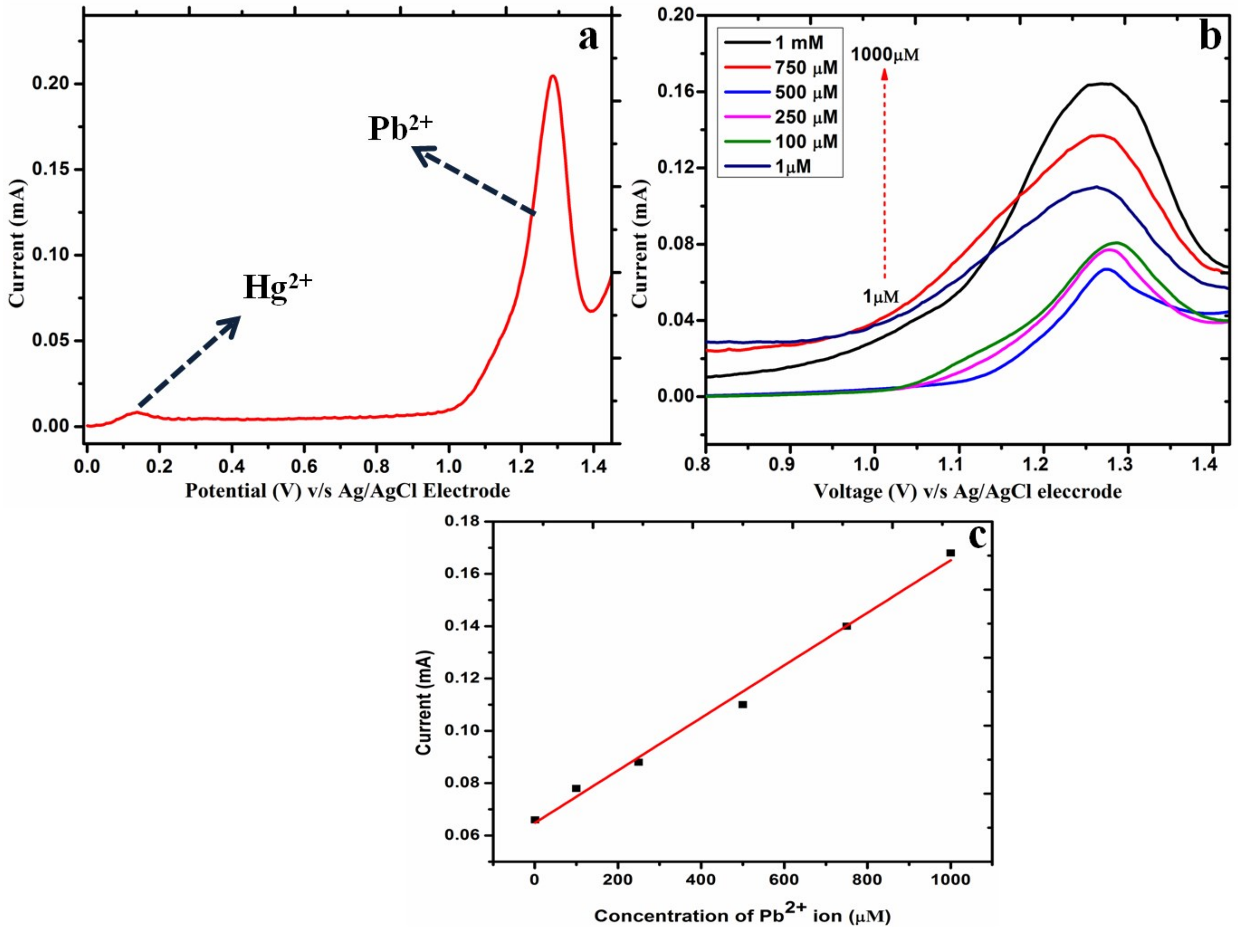

Fig. 3 Linear sweep voltammograms of Glu-h-ZnO/GCE (a) for a mixture of 10^{-3} M solutions of each Pb(II), Hg(II) and Cd(II) solution, (b) for different molar concentrations (1μM to 1mM) of Pb(II) ion in 0.1M KNO_3 solution at a scan rate of 0.05 mV/s (v/s. Ag/AgCl electrode), (c) relation between different concentrations of Pb(II) ion and the corresponding anodic peak currents. It can be seen that the peak current varies linearly with the Pb(II) ion concentrations with a correlation coefficient of 0.993 in a plot of peak current v/s concentration of Pb(II) ion solutions (Fig. 3c). The sensitivity of the modified electrode for Pb(II) ion was calculated from the slope of peak current v/s concentration plot and the value was found to be 1.130×10^{-4} mA μM^{-1}. Besides, the low limit of detection (LOD) of 34.5 μM (3σ method) is obtained which is quite satisfactory while considering the guideline value in drinking water for this particular metal ion. The results indicate

that the Glu-h-ZnO/GCE can be used as a highly selective and sensitive electrochemical sensor for Pb(II) ion which can detect the Pb(II) ions present in the water samples at trace levels.