

From Red Selenium to Cuprous Selenide: Novel and Facile Route to High Performance Metal Selenide Cathode for Sensitized Solar Cells

Supporting information.

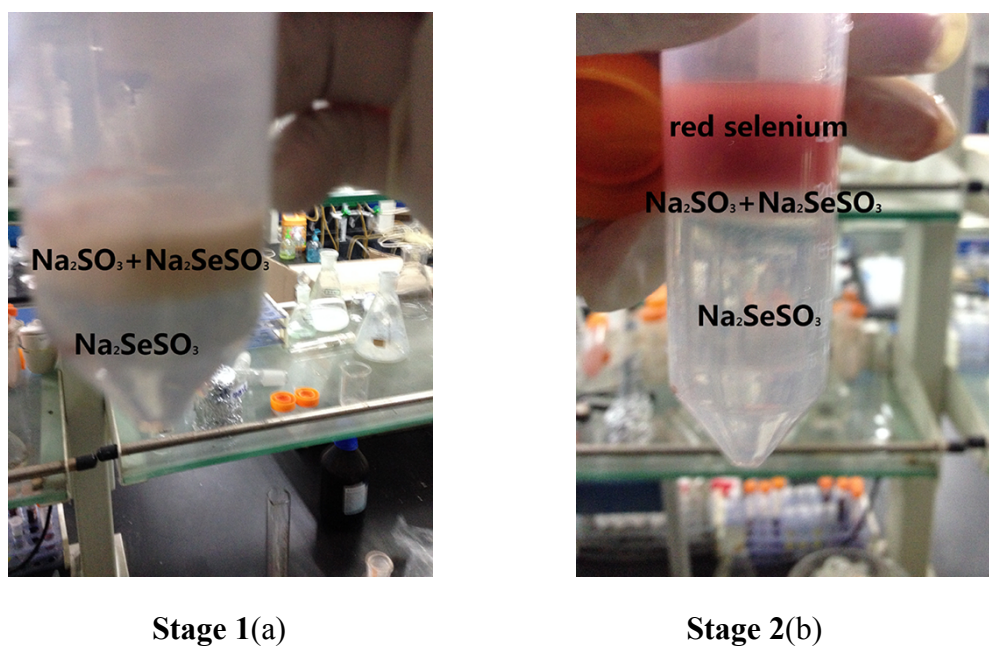


Figure R1: evolution photographs of Na_2SeSO_3 aqueous solution with addition of ethanol (a) immediately and small amount; (b) after 30s and more ethanol.

As shown in (Figure R1a, instead of spraying ethanol onto glass substrate, we slowly added ethanol to the Na_2SeSO_3 aqueous solution. The solution appears stratification immediately after the ethanol addition. Simultaneously, white precipitate merges at the ethanol-water interfaces. This white precipitate should be Na_2SO_3 or mixed $\text{Na}_2\text{SO}_3 + \text{Na}_2\text{SO}_4$ due to its smaller solubility in ethanol than in water. Due to the precipitation of Na_2SO_3 , there is less soluble Na_2SO_3 to stabilize Se^{2-} in the solution, leading to the oxidation of Se^{2-} to form amorphous red selenium in ethanol.

With further addition of ethanol and time flow, the red selenium mainly forms and

disperses in ethanol as depicted in stage2, figure R1b. The white layer mentioned is still obvious at water-ethanol interfaces.

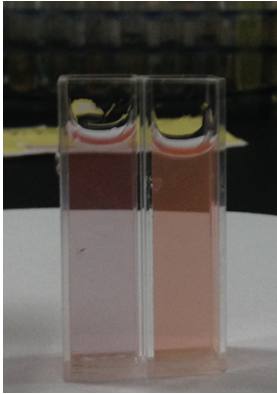


Figure R2a



Figure R2b

(Figure R2) Left (a) red selenium dispersed in water after 3days with different sizes (prepared with ethanol (left) prepared with methanol (right)). (b)Right: red selenium on FTO substrate after 3days and one turned to dark cuprous selenite counter electrode at up-left corner.