Microwave synthesized ruthenium antimony oxide-graphene nanocomposite materials for asymmetric supercapacitors. By Precious Ekwere

INTRODUCTION

Supercapacitors

Electrical energy storage devices for portable electronics, memory backup systems, hybrid electric vehicles etc. Higher energy density than physical capacitors, higher power density and longer cycle life than lithium-ion batteries.

Graphene

- Electrical double layer capacitance
- Theoretical performance: 21 μF/cm^2 or 550 F g^{-1} (single-layer) *Improve performance, Increase surface area + active species.

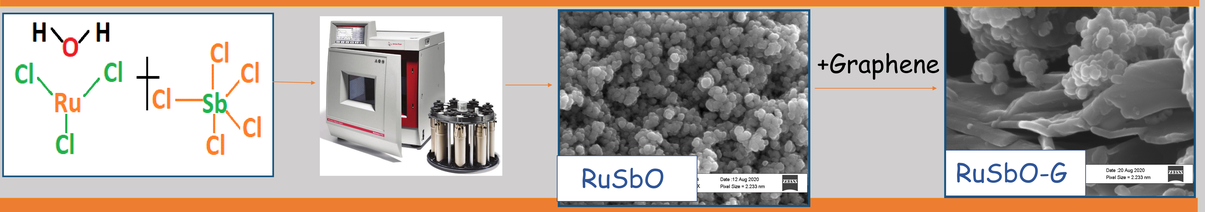
Ruthenium

- Pseudocapacitance
- Faradaic reactions are easily reversible, wide voltage range
- high electrochemical conductivity (~105 S cm^{-1})
- good cycle life and high theoretical capacitance (1450 F g^{-1}).

Antimony

- Pseudocapacitance
- Demonstrate high capacity, and wide working voltage.
- High capacity (660 mAhg^{-1})
- Its Major drawback is its volume expansion

EXPERIMENTAL



RESULTS AND DISCUSSION- CHARACTERIZATION

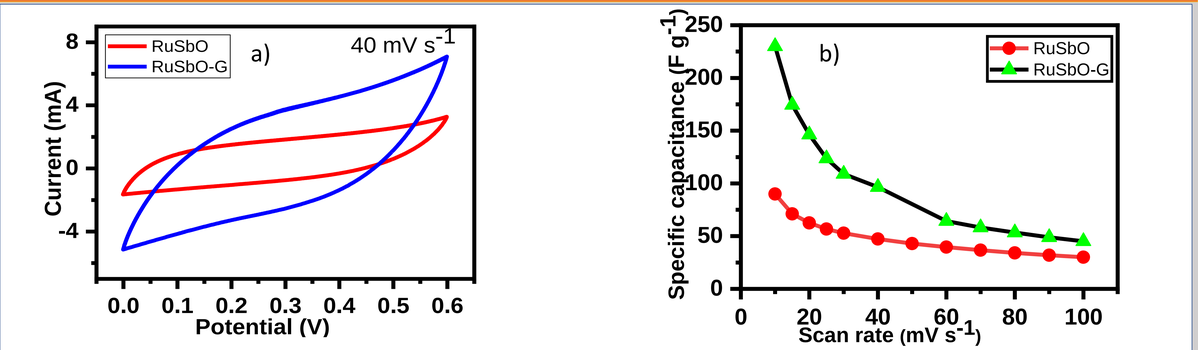
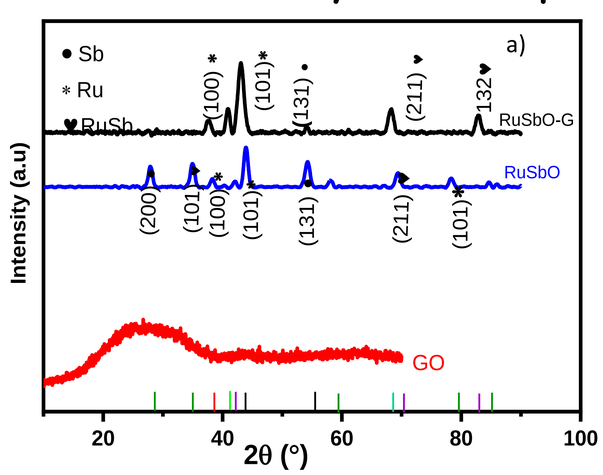


Fig 1: a) CV Plot of RuSbO and RuSbO-G in IM Li_2SO_4 . b) Capacitance of RuSbO and RuSbO-G at different scan rates.



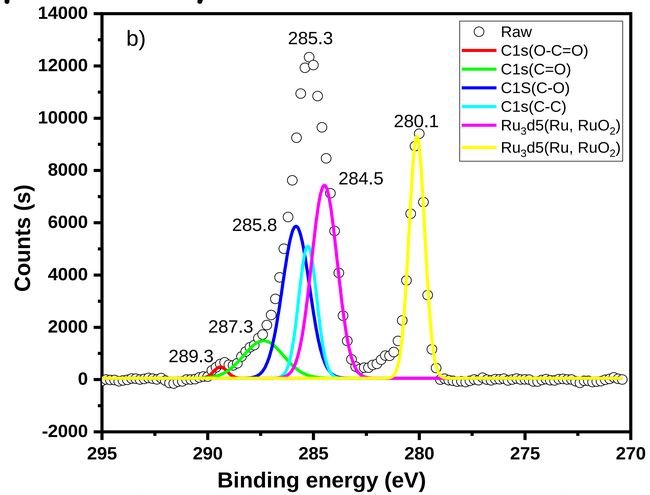
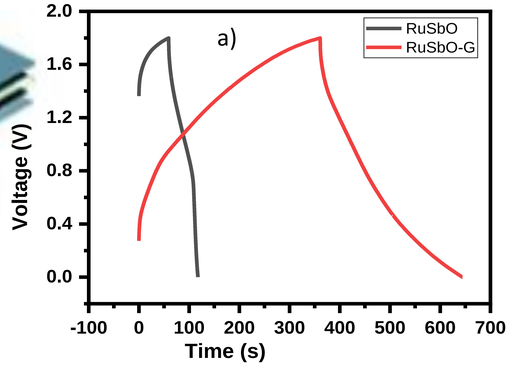


Fig 2: a) The XRD data of RuSbO and RuSbO-G overlayed with graphene. b) XPS Spectra of XPS spectra of Ru 3d+C1s RuSbO-G.

APPLICATION



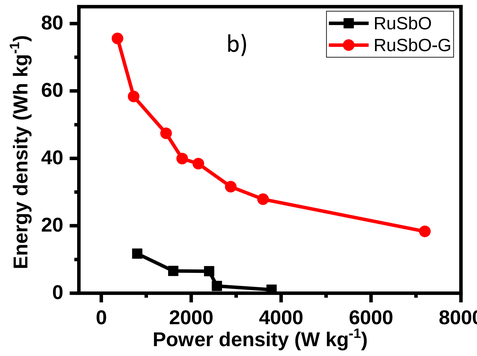


Fig 3: a) GCD plots comparing their charge and discharge profile at 0.2 A g $^{-1}$ current density, b) is the Ragone plot. All analysis was done in Li_2SO_4 electrolyte.

CONCLUSION

- RuSbO and RuSbO-G was synthesized for supercapacitors
- The materials have been characterised and the results have been analyzed, and have shown to be a promising material for supercapacitor
- RuSbO-G showed better electrochemical performance when compared to the pristine RuSbO material.
- RuSbO-G was used to fabricate an asymmetric supercapacitor device, and the maximum energy density obtained was 25 W h kg^{-1} at 320 W kg^{-1} power density.

ACKNOWLEDGEMENT

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