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Molten Base Carbonisation and Activation of Bamboo Shoots to Capacitive Carbon

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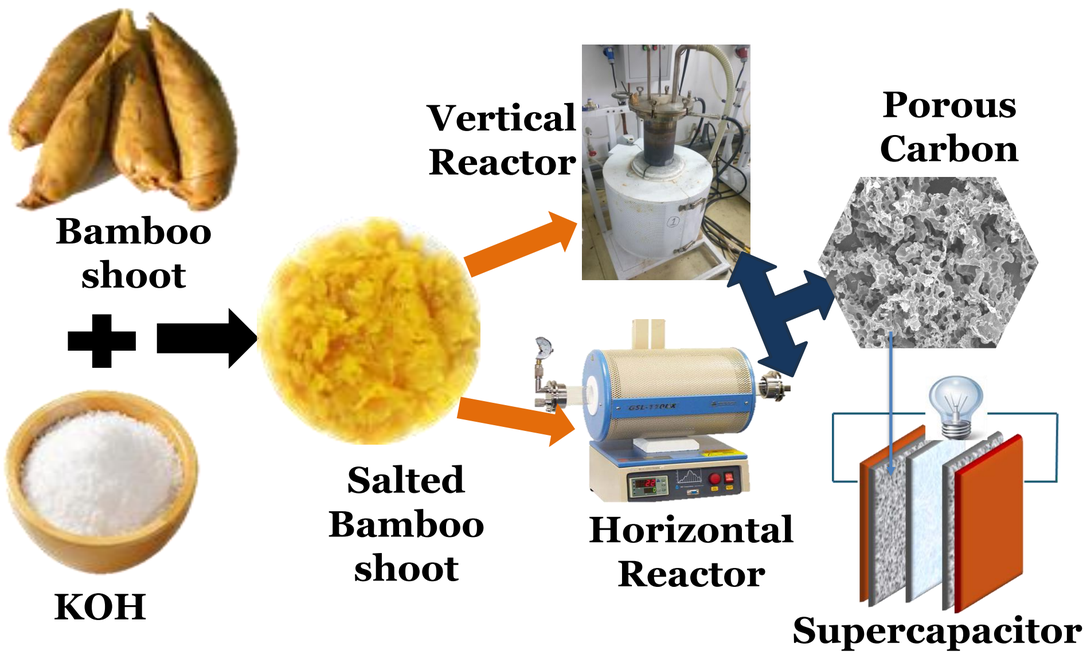
INTRODUCTION & AIM

Obtaining functional carbon from waste biomass sources for Energy storage application (supercapacitor) involves multistage processes that are complex and involves carbonization before activation; high temperature, expensive and not environmentally friendly.

Therefore, the aim of this research is to develop a facile, sustainable and environmentally friendly process route to obtain porous carbon that is comparable to the current commercially available one.

METHOD



Process conditions at 700˚C for 1 hr.

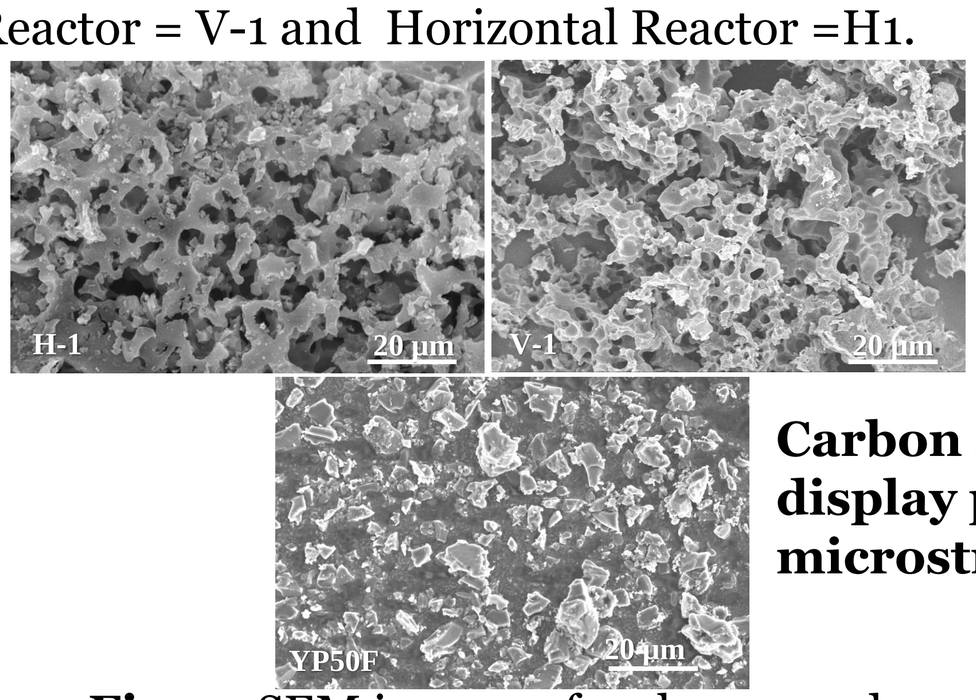
Fig. 1: Schematic representation of process route.

- **Material Characterization:**

Scanning Electron Microscope (SEM), N2 Adsorption /Desorption measurements.

RESULTS & DISCUSSION

Nomenclature: Commercial = YP50F, Vertical Reactor = V-1 and Horizontal Reactor =H1.



Carbon samples display porous microstructures.

Fig. 2: SEM images of carbon samples.

RESULTS & DISCUSSION

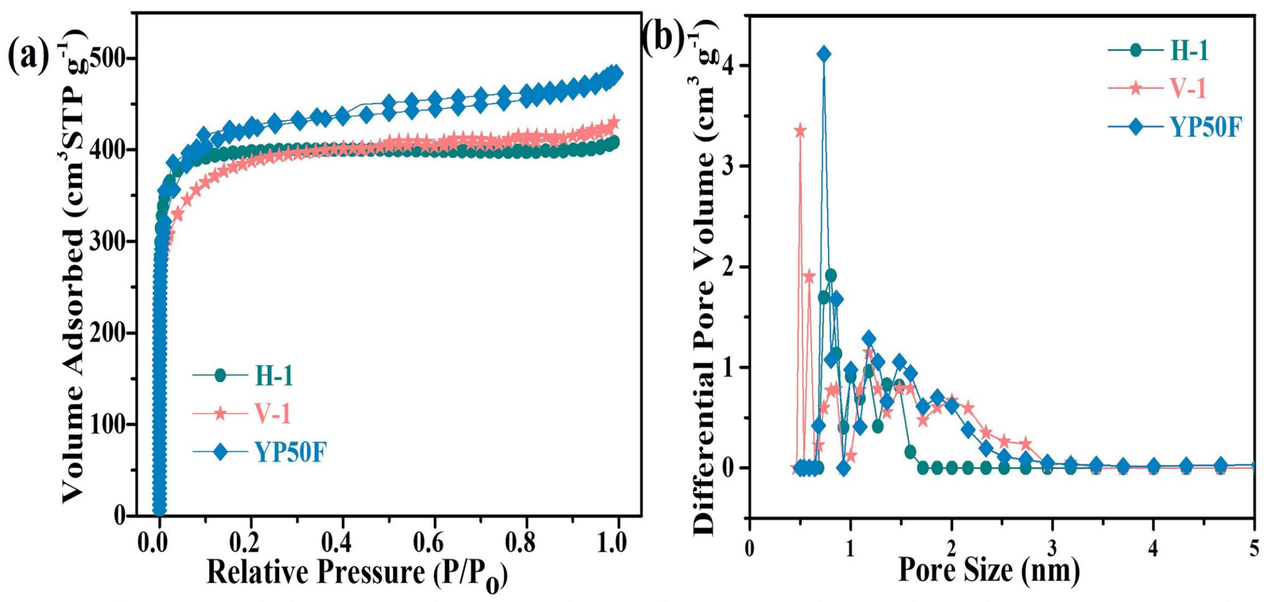
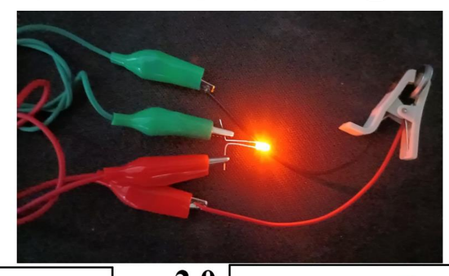


Fig. 3: (a) N2 adsorption-desorption isotherms, and (b) pore size distribution for V-1, H-1 and YP50F.

Specific surface area of 1198 m² g⁻¹ for V-1, 1190 m² g⁻¹ for H-1 and YP50F (1425 m² g⁻¹)

Application of derived carbon in symmetric supercapacitor.



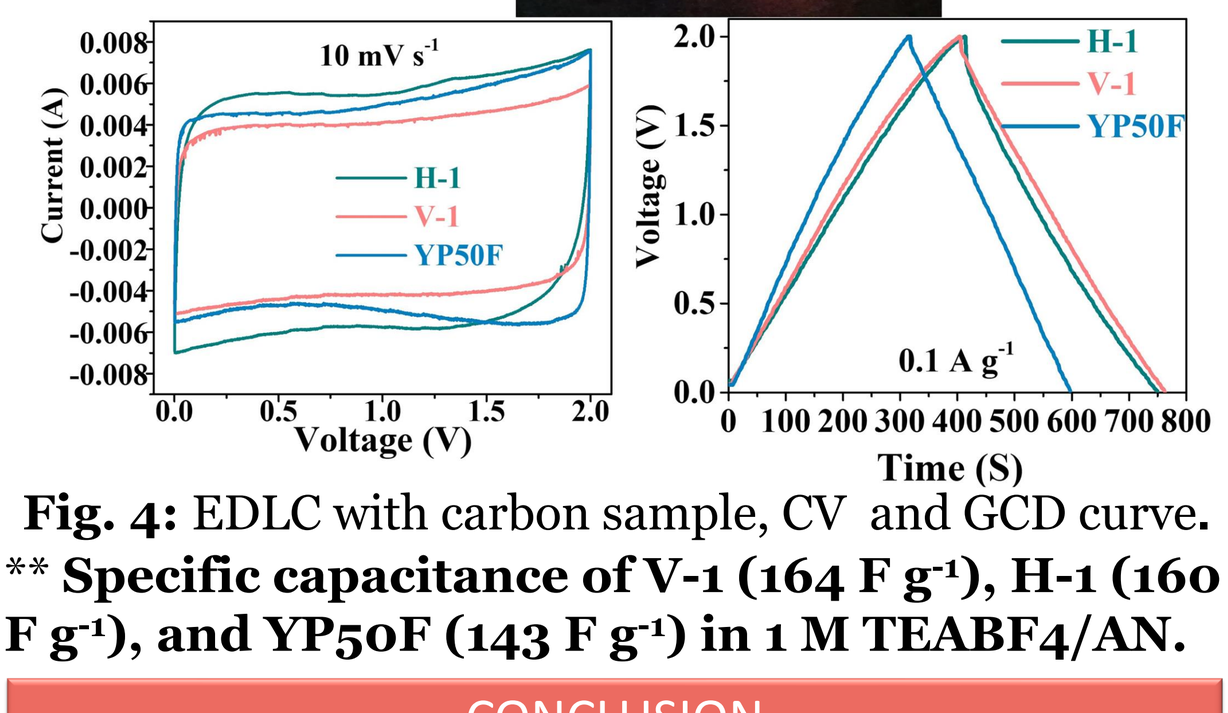


Fig. 4: EDLC with carbon sample, CV and GCD curve.

** **Specific capacitance of V-1 (164 F g⁻¹), H-1 (160 F g⁻¹), and YP50F (143 F g⁻¹) in 1 M TEABF4/AN.**

CONCLUSION

Molten base carbonisation and activation has been used to convert biomass to porous carbon in single stage process. Derived carbon shows outstanding electrochemical performance in supercapacitor.

FUTURE WORK / REFERENCES

- Use various types of salts and eutectic mixtures, temperatures and time to optimize the process.
- Use other biomass sources with same process.

Egun I. L., et. al, (2022). Molten Salt Carbonization and Activation of Biomass to Functional Biocarbon. *Advanced Sustainable Systems*.

Lvye Y., et. al, (2019). Molten salt synthesis of hierarchical porous carbon from wood sawdust for supercapacitors. *J. Electroanalytical Chemistry*.