

## Introduction

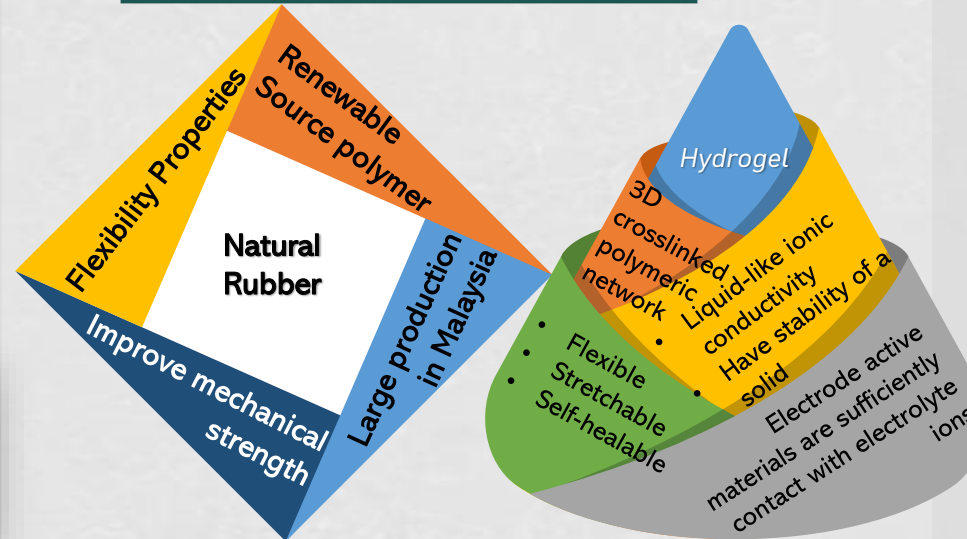


**Hydrogel electrolyte** has become the ideal candidate for electrolyte materials

- Leakage-free
- Flexible
- High ionic conductivity



## Implication of study

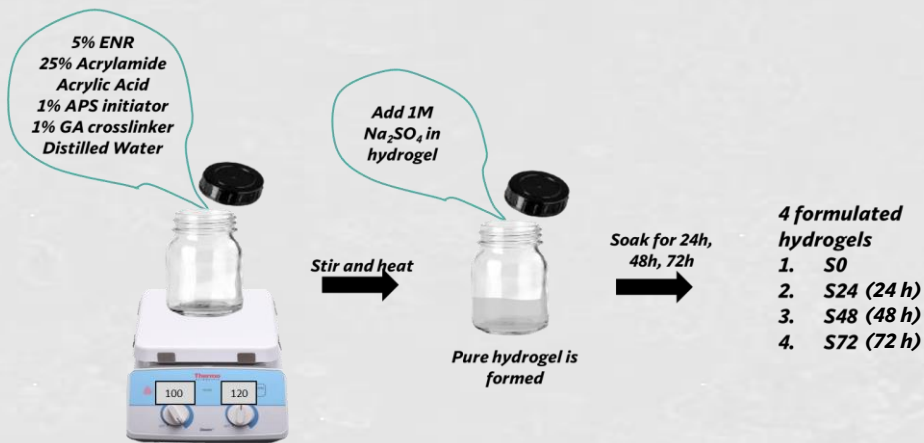


## Purpose of Study

1. To determine the ion transport analysis and the of the natural-rubber based polymer electrolyte
2. To study the effect of soaking time on the performance of hydrogel electrolytes
3. To fabricate and evaluate the performance of eco-friendly flexible supercapacitor for wearable applications

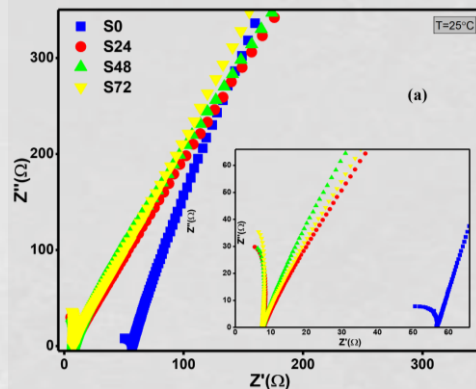
## Design & Methodology

### i. Hydrogel Preparation



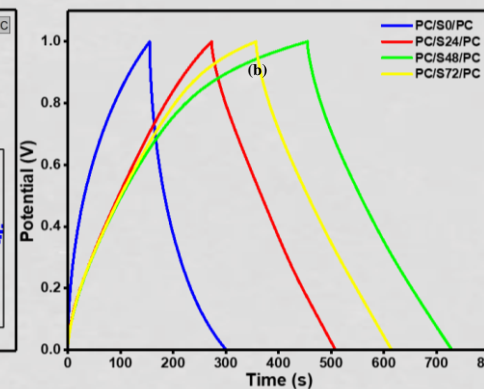
## Significant Outputs

### Electrochemical Impedance study

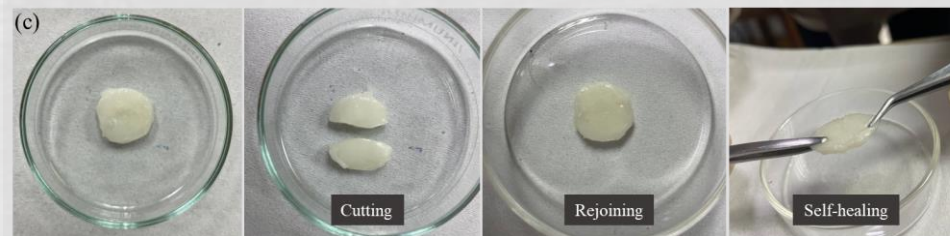


(a) Imaginary versus real impedance spectroscopy

### Galvanostatic charge-discharge study



(b) GCD of all samples at 100 mA/g



(c) Self-healing process of S48 (best sample)

Sample	Type	Ionic Conductivity (S cm <sup>-1</sup> )	Specific Capacitance (F g <sup>-1</sup> )
S48	Hydrogel	1.94 × 10 <sup>-2</sup>	55.65 (at 100 mA /g)

**7 AFFORDABLE AND CLEAN ENERGY**  
Ensure access to affordable, reliable, sustainable and modern energy for all 01

**Natural Resources**  
• Provide cost-effective and efficient ways for innovation  
• Driver for green growth and sustainable development. 02

**10 MySTIE FRAMEWORK**  
Environment and Biodiversity  
Utilizing natural rubber polymer source as a sustainable approach and unlock the terrestrial value of ecosystems 03

## Conclusion

1. Good performance of hydrogel electrolyte with natural-based resource for high performing supercapacitor is produced.
2. A device with environmental-friendly features, high ionic conductivity, and best capacitance is fabricated.

## References

[1] L. Guo *et al.*, "A chemically crosslinked hydrogel electrolyte based all-in-one flexible supercapacitor with superior performance," *Journal of Alloys and Compounds*, vol. 843, p. 155895, 2020

[2] S. Bashir *et al.*, "Synthesis and characterization of hybrid poly (N, N-dimethylacrylamide) composite hydrogel electrolytes and their performance in supercapacitor," *Electrochimica Acta*, vol. 332, p. 135438, 2020

### ii. Energy Storage Device –Supercapacitor Fabrication

- Electrolytes were sandwiched between two activated porous carbon electrodes
- Placed between two stainless steel blocking electrodes.

