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Exploring Sustainable Strategies for the Conversion of Anaerobic Digestate into Value-added Electroactive Materials

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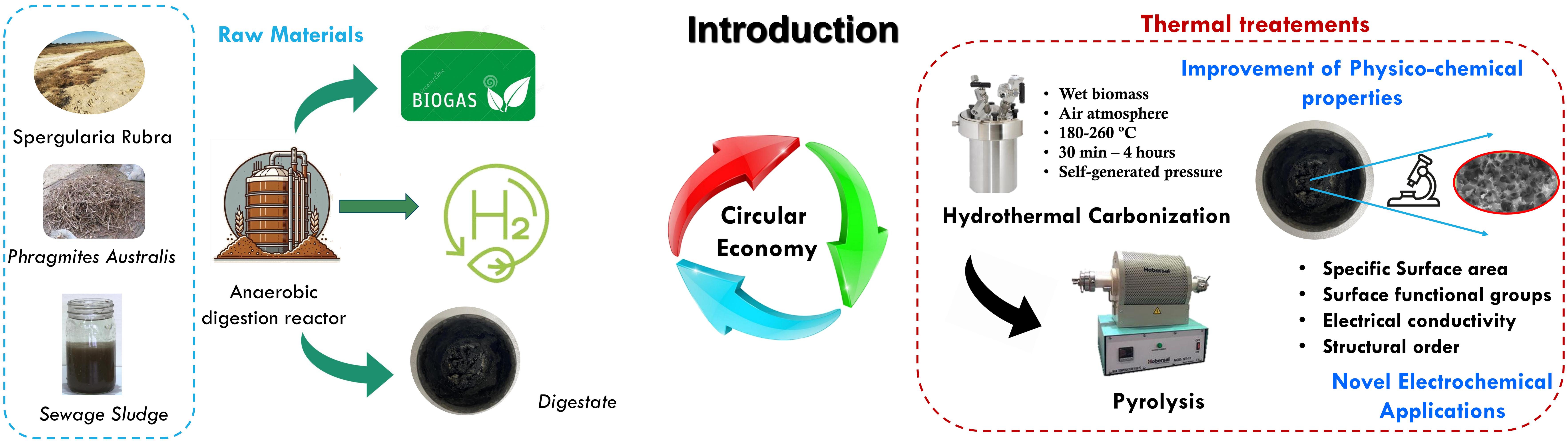
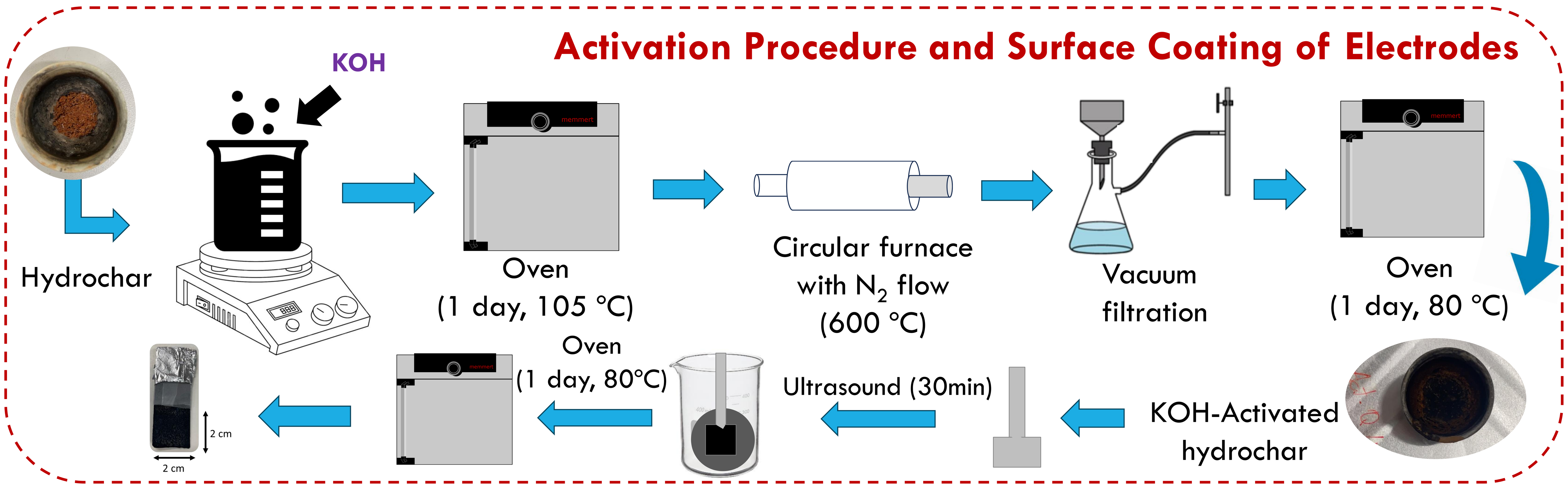
Introduction



Materials & methods

REACTOR for HTC



Results & Discussion

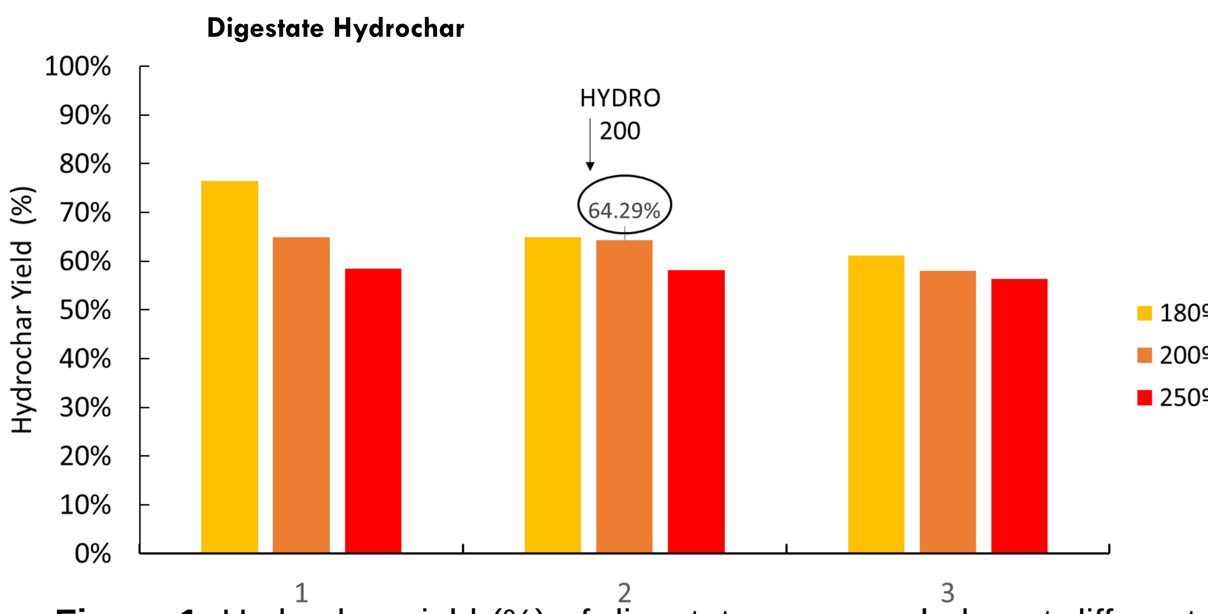


Figure 1. Hydrochar yield (%) of digestate sewage sludge at different temperatures (180ºC, 200ºC and 250ºC) and three residence time of 1,2 and 3 hours. Ratio Mass/Vol (150g/L)

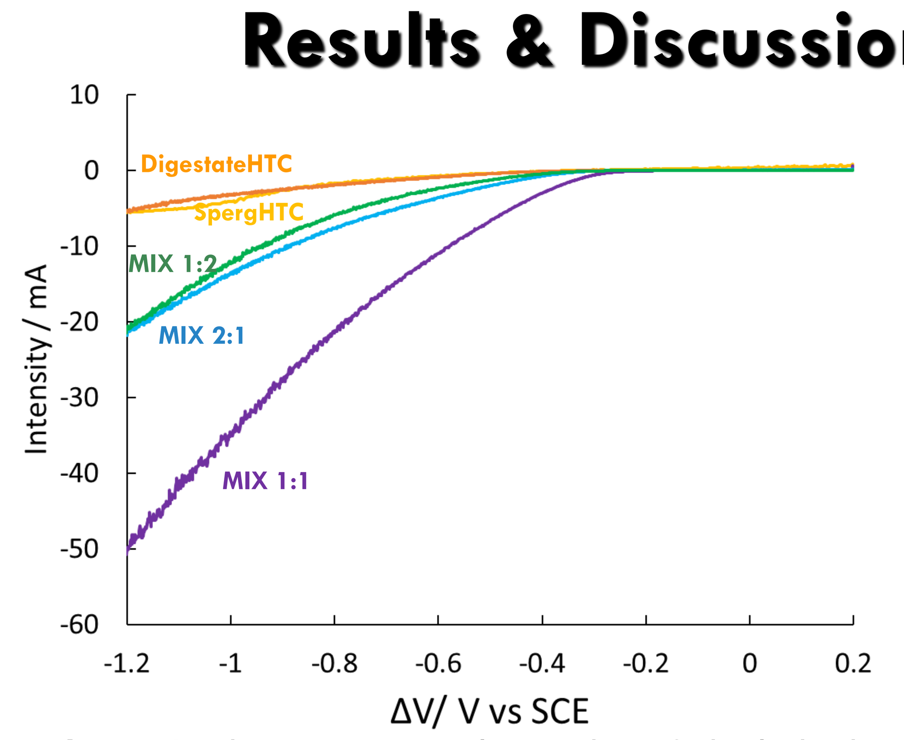


Figure 2. Linear sweep voltametries of single hydrochars and some hydrochar mixtures. 0.05 M Na_2SO_4 electrolyte. anode: bare graphite cathode: Toray Paper 4 cm^2 SCE as reference electrode.

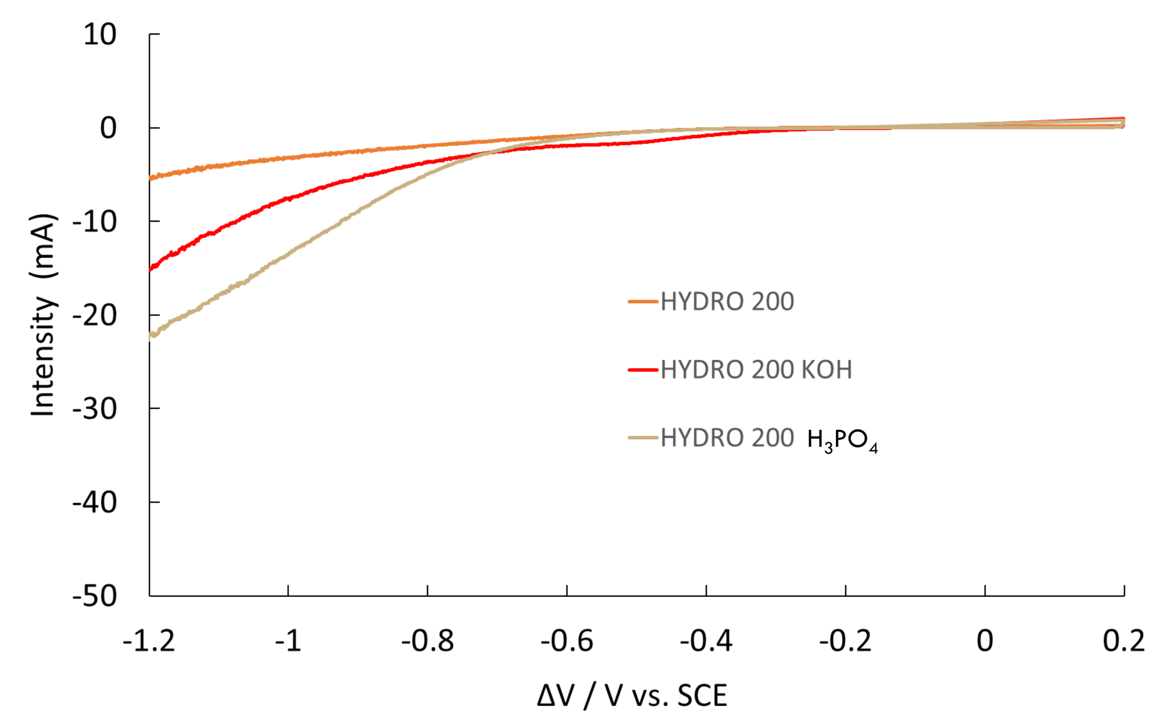


Figure 3. Linear sweep voltametries of digestate hydrochar and some chemically activated hydrochar. 0.05 M Na_2SO_4 electrolyte. anode: bare graphite cathode: Toray Paper 4 cm^2 SCE as reference eletrode

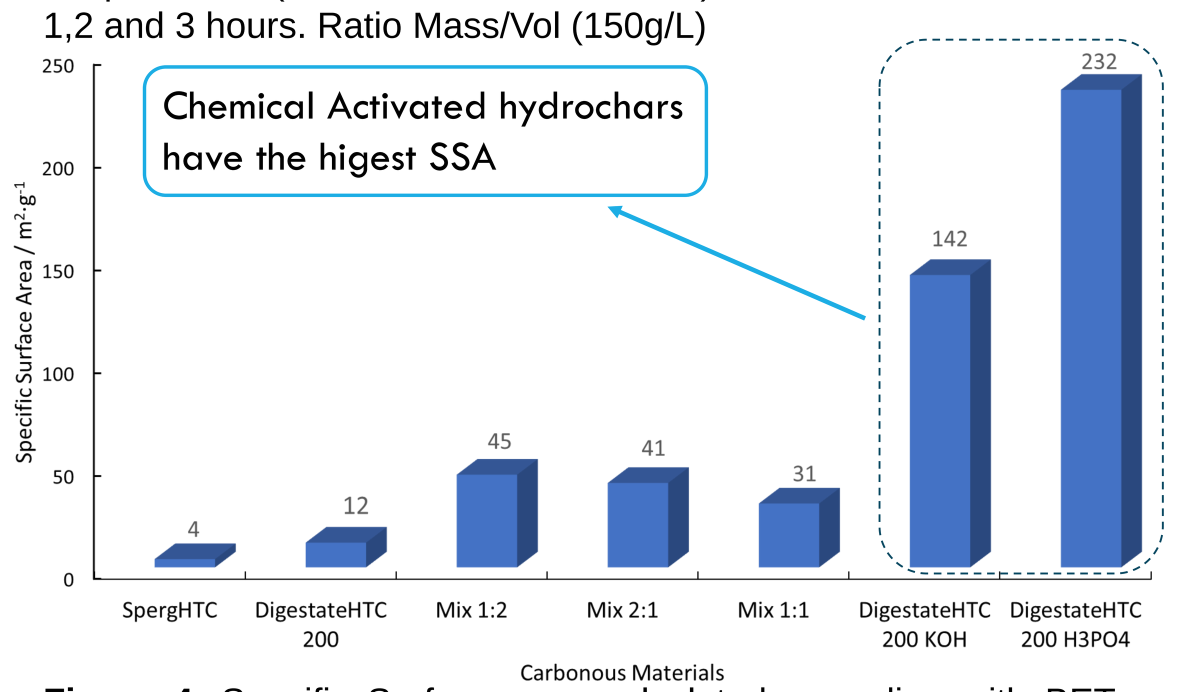
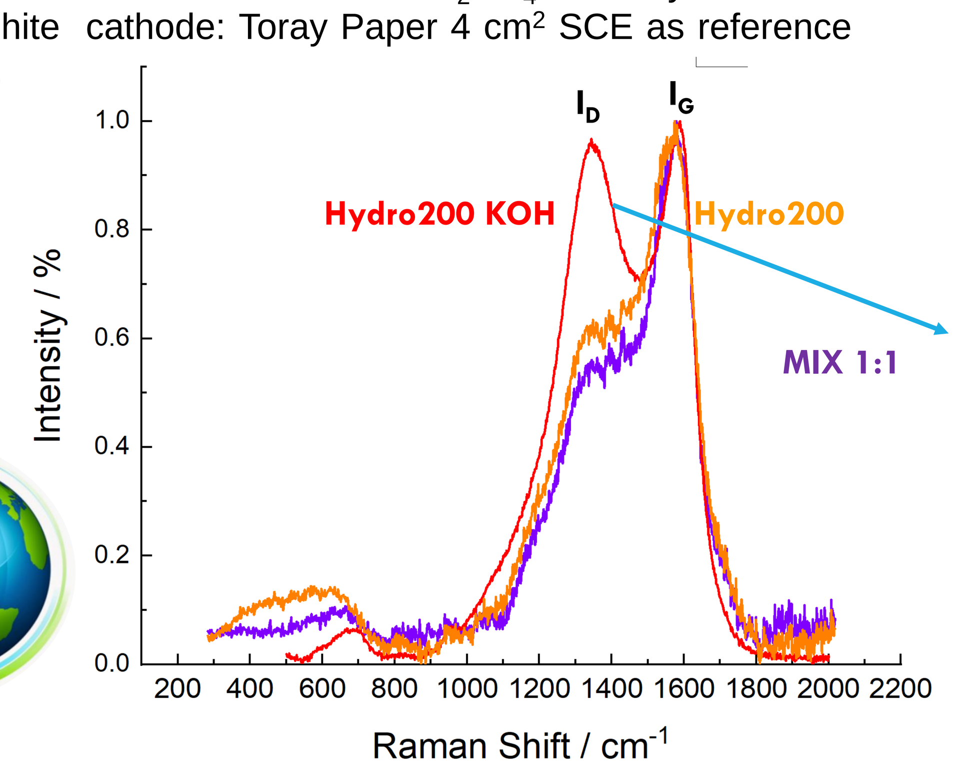


Figure 4. Specific Surface area calculated according with BET procedure from N_2 adsorption-desorption isotherms of the studied carbon materials.



Structural defects are generated during the activation, however they do not promote the best electrochemical activity for the oxygen reduction reaction

Figure 5. First order of Raman spectra of studied carbon materials.

Conclusions

- ✓ Different wastes (biomass wastes, sewage sludge…) can be used as a potential feedstock of electrochemical applications promoting circular economy pathways.
- ✓ Mixed 1:1 hydrochars and digestate-derived hydrochar Activated with H_3PO_4 seems to have the highest electrocatalytic activity for oxygen reduction reaction.
- ✓ Specific Surface area, structural defects are enhanced with thermal and chemical treatements which improve their electrocatalytic properties, however best result was obtained with mixed hydrochar at 200ºC.

References

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