Vine shoot-derived hard carbons as promising anodes for sodium-ion batteries: valorization of pig manure as HTC solvent.

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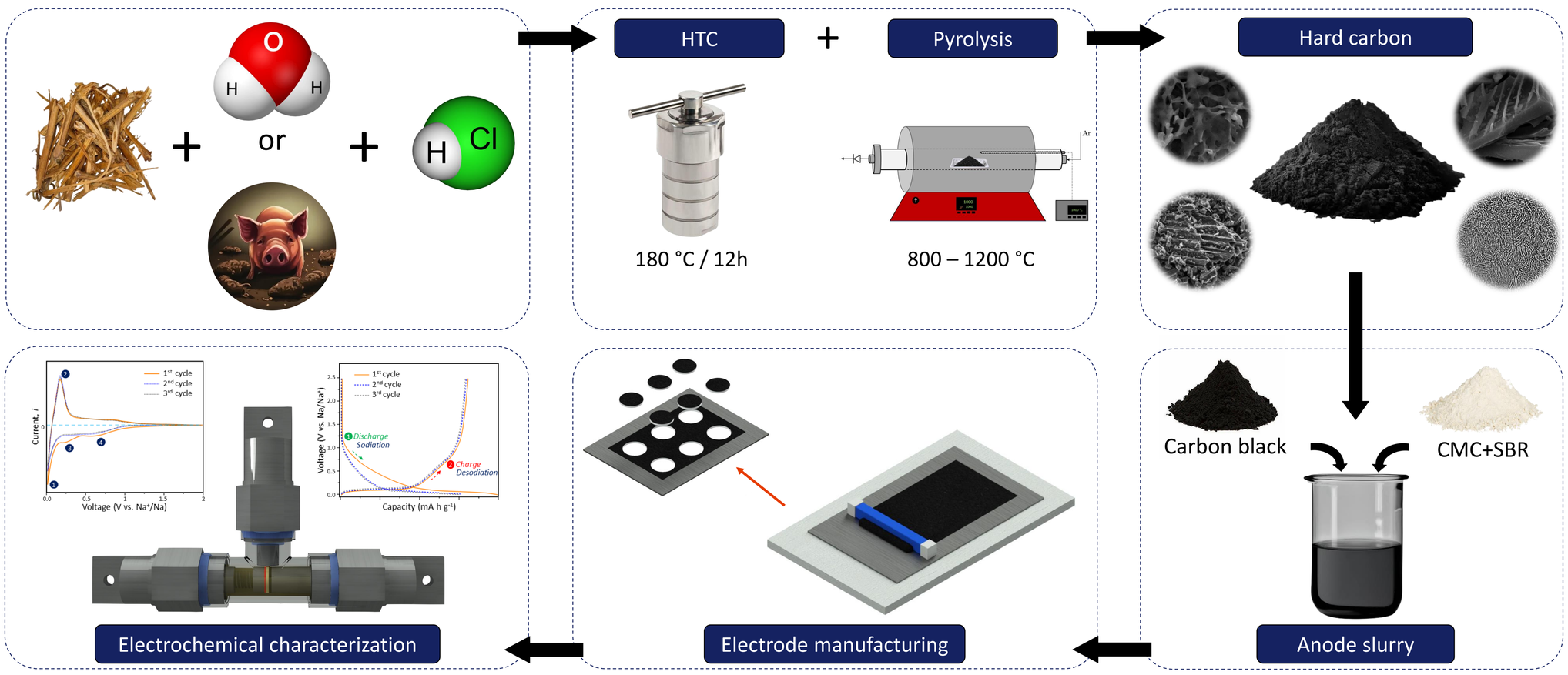
Introduction

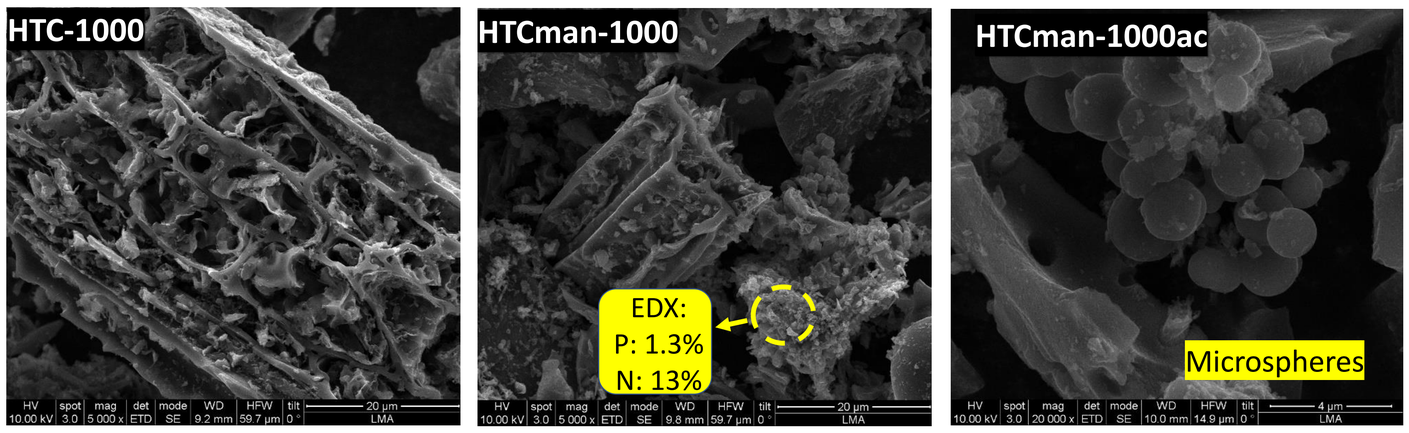
- Sodium-ion batteries (SIBs) are one of the most promising candidates to lead the next generation of large-scale electrochemical energy storage systems required to support the grid integration of intermittent renewable sources. However, the implementation of this technology is contingent upon the development of new high-performance anodes.
- Hydrothermal carbonization (HTC) of biomass wastes can promote the enlargement of the hard carbon pores and the creation of surface nanospheres to improve the reversible capacity of the electrode. In addition, the HTC treatment allows the addition of other chemicals to the aqueous solution in order to promote certain decomposition or doping reactions.

Materials and methods



Results

	d_{002} (nm)	L_a (nm)	BET CO_2 (m^2 g^{-1})	BET N_2 (m^2 g^{-1})
HTC-800	0.385	2.875	397.34	81.74
HTC-1000	0.381	3.822	444.96	17.28
HTC-1200	0.379	4.303	51.87	17.39
HTC-1000ac	0.381	3.654	450.30	125.34
HTC_{man}-800	0.383	3.068	433.88	138.91
HTC_{man}-1000	0.378	3.612	369.60	23.28
HTC_{man}-1200	0.379	4.826	33.79	13.15
HTC_{man}-1000ac	0.380	3.469	451.64	110.13



Conclusions

HTC-1000

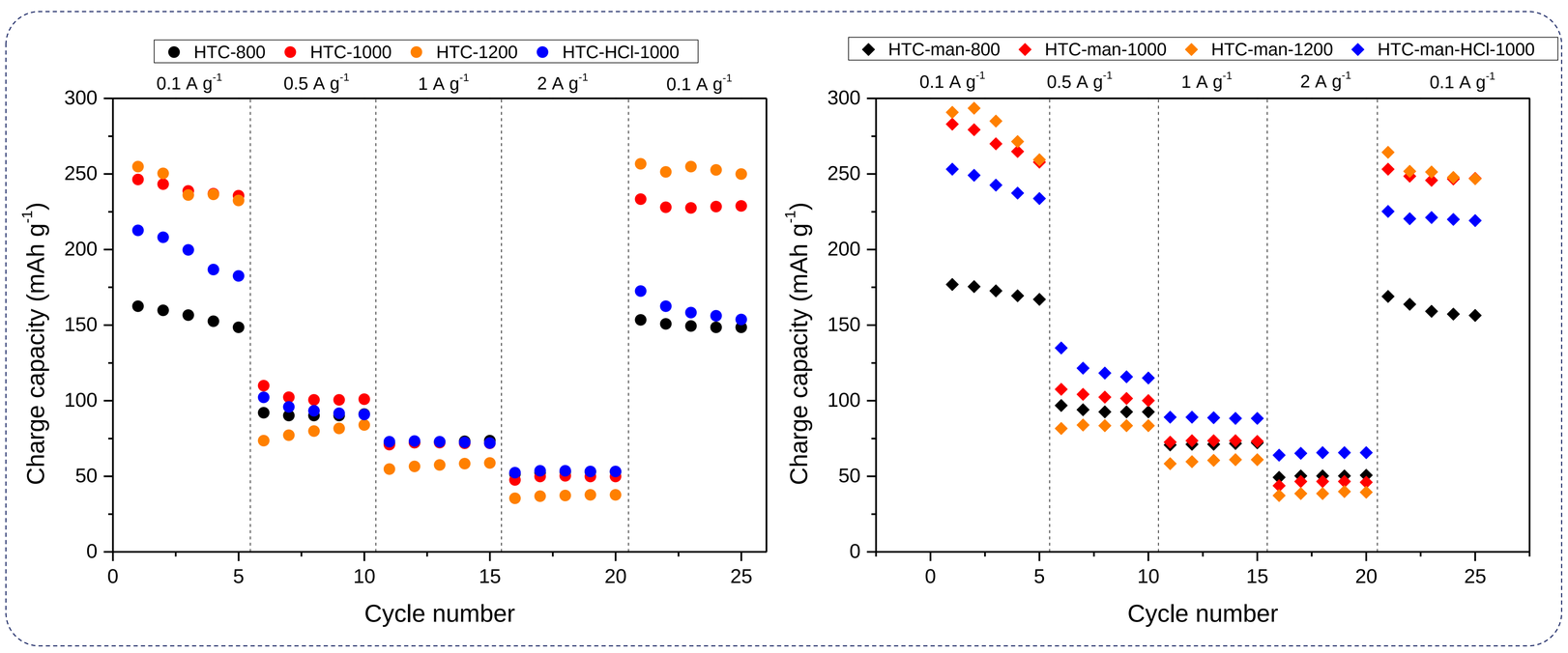
- Preservation of the vine shoots 3D structure.
- Development of open and closed ultra-microporosity.
- Optimum equilibrium between structural ordering, porosity, and defects.

HTC_{man}-1000

- Incorporation of heteroatoms to improve the electrochemical performance .
- Valorization of a livestock waste whose use as fertilizer has severe environmental impacts.

HTC_{man}-1000ac

- Development of expanded pseudographitic domains and microspheres clusters.
- Improvement in the rate capability of the electrode.



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