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OBSTACLES IN HYDROGEN STORAGE

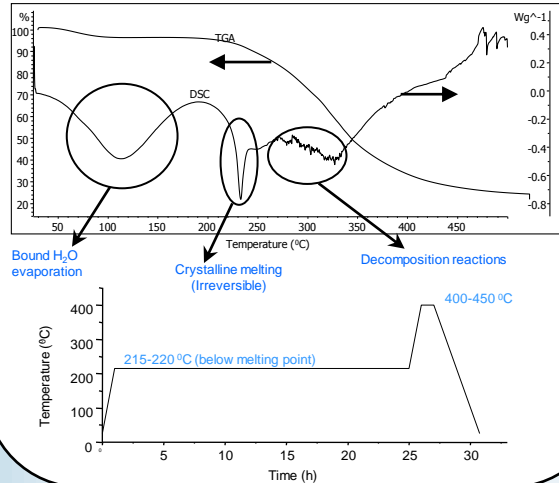
- ◆ The hydrogen storage problem lies under its extremely low density at normal conditions (8.98×10^{-5} kg/L).
- ◆ At room temperature and atmospheric pressure it is not possible to drive a car more than even a mile when we fill our tank with H_2 .
- ◆ Conventional methods of hydrogen storage require large amounts of energy[1].

OBJECTIVES

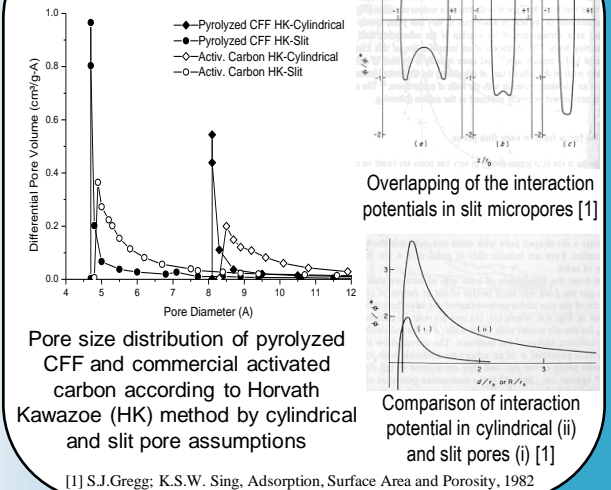
- ◆ Using an agricultural waste, chicken feather fibers (CFF), as a precursor material and obtain a high surface area material.
- ◆ Investigating the details of the carbonization process of feather fibers and optimizing certain process parameters to increase the number of pores suitable for hydrogen adsorption.

[1] J.L.C. Rowsell, O.M. Yaghi, *Angewandte Chemie-International Edition* 44 (2005) 4670.

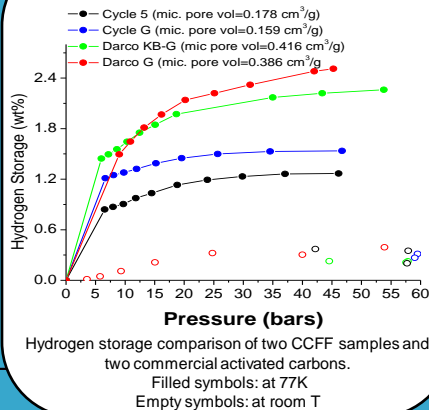
CONTROLLED CARBONIZATION (PYROLYSIS) OF CFF IN N_2 ATMOSPHERE



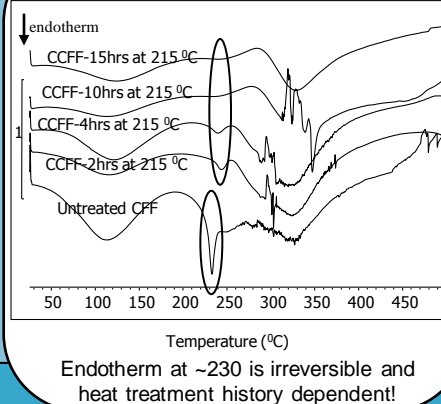
CCFF PORE SIZE DISTRIBUTION



H_2 ISOTHERMS



EFFECT OF ISOTHERM AT 215 °C



CONCLUSIONS

- ◆ It is possible to obtain a microporous material from chicken feathers which has very tiny pore structure with a very narrow pore size range.
- ◆ Narrow pore size range enables CCFF to adsorb more H_2 per unit pore volume than highly porous activated carbons.
- ◆ Crystalline melting change at ~ 230 °C is irreversible and heat treatment history dependent. This supports the crosslinking hypothesis at this temperature.

FUTURE PLANS

- ◆ Modeling the degradation behaviour of CFF from differential TGA curves
- ◆ Investigating the microporosity enhancement by chemical activation
- ◆ Getting information on the bulk of feathers.

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