

Conversion of waste corncob to activated carbon for use of methane storage

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Introduction

With the depletion of the ozone layer and the global warming and the increased pollution, researchers are always looking for new ways of reusing or recycling various products in our environment.

The Alliance of Collaborative Research in Alternative Fueling Technology and its partners have been researching a way to store natural gas, where we know the main ingredient is methane. The stored gas will be used to fuel vehicles. Methane is one of the cleanest burning fuels.

A new absorbent material has been found at the University of Missouri Columbia made from the remains of corn cob is to store natural gas. A nanoporous carbon material is produced from the waste corn which is referred to as the "sponge for natural gas", where the methane uptake is 120v/v or more.



Missouri being one of the leading states in corn production, MU research team has revealed that there is enough corn waste in Missouri to supply the cars in the entire country. Other material used to make this adsorbent material is olive pits and coconut shell, but are more expensive to produce.

The main focus of the research is to develop flat low pressure high capacity natural gas tank for vehicles holding no greater than 500psi of methane.



This will reduce the effects in the event of an explosion because of lower pressure of the storage tank. This will allow for more trunk space in cars. It is anticipated that Absorbed Natural Gas (ANG) will be the competitor with Compressed Natural Gas (CNG) that holds up to 3600psi that is currently used in transit buses and public utility vehicles. Natural Gas Vehicles operating today include police patrol cars, package delivery vans, U.S. Postal mail delivery vehicles, taxi cars, school buses, transit buses and fork lifts.



Introduction cont'd

With this development, natural gas from different parts of the world can be transported in large scale decreasing the shipping cost. Decrease importation of oil from other countries. It can also be used to extract gas from landfills, which produce the greatest source of methane in the US.



Procedure

- ☑ Corn cob dried and crushed is mixed with phosphoric acid (H^3PO^4), where it serves as an activating agent.
- ☑ Excess phosphoric acid is removed and the mixture is carbonized at 450-650°C in a reactor, after which it is evaporated at 160°C for 3 hours*.
- ☑ It is washed with hot water to bring the pH to a neutral point.
- ☑ The washed activated carbon is dried at 110°C and grinded and sieved to a particle size of 40 mesh.



Using a hydraulic press and a die the powder and a small quantity of binding agent is pressed into monoliths or briquettes to obtain the highest density.



Procedure cont'd

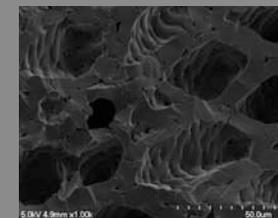
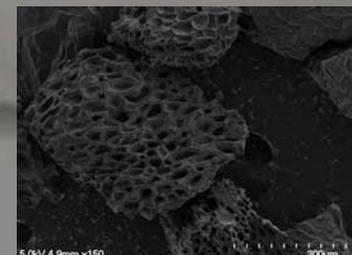
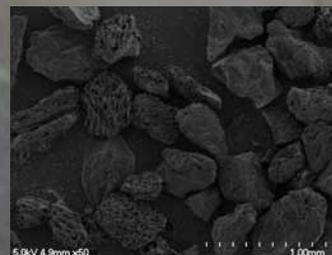
The height and width is calculated and therefore the volume and the density. Compression and abrasion tests are done to test the physical strength of the briquette.

Results

Records have shown that methane uptake can be 120v/v or more.

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Conclusion

Waste corn cob can be converted from a course material to activated carbon and made into monoliths to store natural gas at 120v/v methane uptake with the target being 150v/v.