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CHICKEN FEATHER MEAL AS BIOFUEL AND HYDROGEN CARRIER

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ABSTRACT: It is known that around 11 billion pounds of waste from poultry industry accumulates every year, we also have endless appetite for chicken and other poultry products. The feathers cannot be just kept only in pillows, but we need to utilize it as under grade feed for animal. An environmentally safe process is created for converting feather meal of chicken into biofuel. It is also found that feather meal consists of blood, innards apart from processed chicken feather. So, this way of research, would save much of the fuel input cost for many industries, by using the chicken feather as their energy input. It is a multi beneficial way of processing them into biodiesel, because we have significantly huge amount of feather every year and it's also found protein rich and easy to convert into fuel form. In this paper we preliminarily discuss how chicken feather meal is processed further. Also we will discuss how it may be considered having a potential for an alternative energy in different forms. Apart from using it as energy, how can we use it for other value added products such as holdup of hydrogen, is also discussed.

KEYWORDS: Biofuel, Chicken feather meal, Innards, Poultry, Protein.

INTRODUCTION

Today the world is in demand of energy. The more the development takes place, the more will be the energy requirements. According to International energy outlook 2013, world energy consumption will grow by 56 percent between 2010 and 2040. Every countries development is measured in the quantum of energy it produces and uses for its industries and domestic purposes. Thus finding the alternate and new energy resources right from now would be of great help. One such kind of the source is Chicken feather meal. It can be processed to biofuels or it can even be used for other energy sources. It can be best understood from the below passages.

PROCESS SCHEME OF PROCESSING CHICKEN

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PICTURE SHOWING STAGES OF CONVERSION OF CHICKEN FEATHER TO FEATHER MEAL

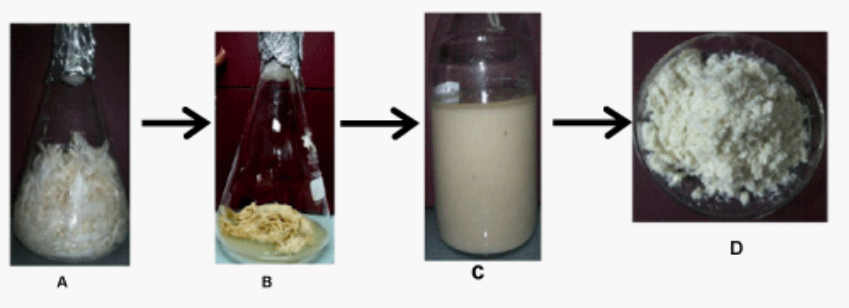
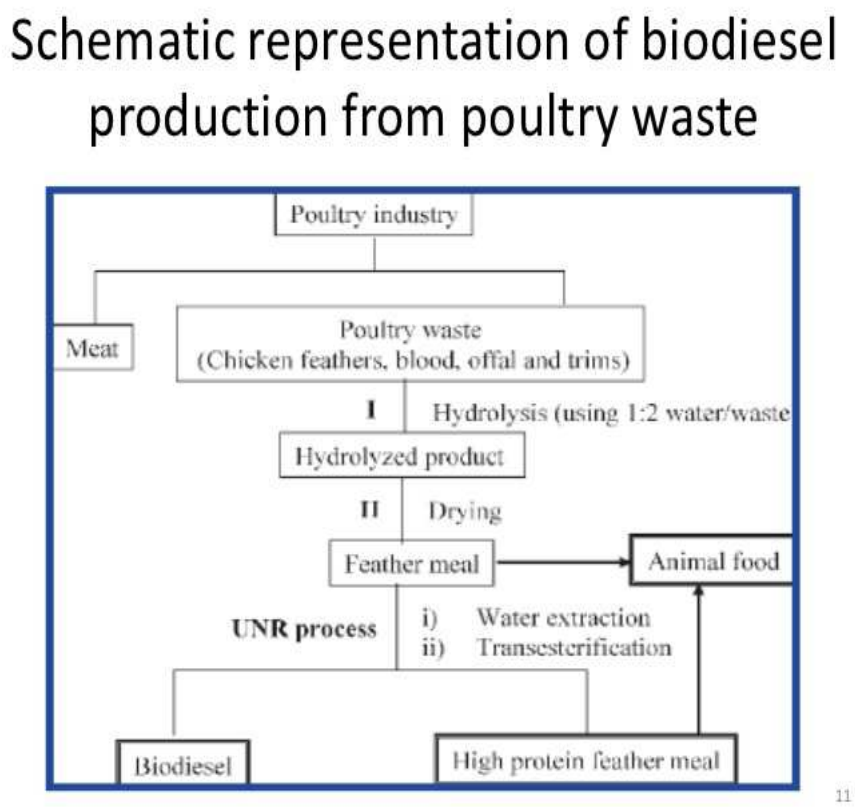


Figure 3: Various step of conversion of feather to feather meal.

A. 25g feather before pre-soaking and boiling, **B**. Feather after pre-soaking and boiling, **C**. Feather meal after 12h with 12,000U enzyme treatment, **D**. Dried feather meal.

SIGNIFICANCE OF CHICKEN FEATHER MEAL AS A RAW MATERIAL FOR BIODIESEL

Chicken feather meal is processed at higher temperatures with steam, and it can be used as animal feed and also as fertilizer. It has high percentage of protein and nitrogen. Earlier, the focus wasn't there on the 12% fat content of the chicken feather meal. Later it is concluded that feather meal has potential as an alternative, for the production of biofuel and also it's a non-feed stock for it. Fat is extracted from chicken feather meal using boiling water and later it is processed into biodiesel. Additionally there are two advantages of extracting fat from feather meal, It provides both a higher-grade animal feed besides a better nitrogen source for fertilizer applications.



SOME INTERESTING STATISTICS

By statistics, if we consider feather meal produced from the poultry each year, we could produce a huge sum of 153 million gallons of biodiesel per year in the U.S, and accordingly 593 million gallons across the world. There is a significant amount of cutoff of the energy resource, which otherwise might be spent on fossils and non-renewable energy sources, which ultimately have impact on environment. So, it's two way benefit to us and the environment. It also contains stronger and more absorbent keratin fiber compared to wood, which is a valuable fossil.

USES OF THE FEATHER

Another intresting thing is that, carbonized chicken feathers which bear resemblance to highly versatile and small carbon nanotubes, which can be utilized to store hydrogen for fuel-cell vehicles. Observably, we notice that very tiny natural sponges of chicken feathers have a huge weight advantage over metal hydride storage.

In addition, feathers can also be used to manufacture a variety of products such as storm resistant roofing materials, car parts and computer circuit boards .

APPLICATION OF CHICKEN FEATHER AS HYDROGEN STORAGE TANKS

Hydrogen, the most common element in the universe, has been considered as a clean and abundant energy alternative to fossil fuels for many years. But its physical characteristics make it very difficult to store and transport .It takes 40 times as much space as gasoline when pressurized .In liquid state, it needs to be kept at extremely low temperatures.

The problem with hydrogen as a gas or liquid is its density is too low. Using currently available technology, it only drives a mile, if you have a 20-gallon tank and filled it with hydrogen at typical room temperature and pressure. Carbonized chicken feathers works well for hydrogen storage.

Carbonized chicken feather fibers holds the potential of improving drastically existing methods of hydrogen storage and would pave the way for the practical development of a truly hydrogen-based energy economy. Chicken feather fibers are mostly composed of keratin, which is a natural protein that forms strong, hollow tubes. When they are heated, this protein creates crosslinks, which strengthen its structure, and becomes more porous, finally increase its surface area. The Ultimate result is carbonized chicken feather fibers. They can absorb as much or even more hydrogen than carbon nanotubes or metal hydrides.

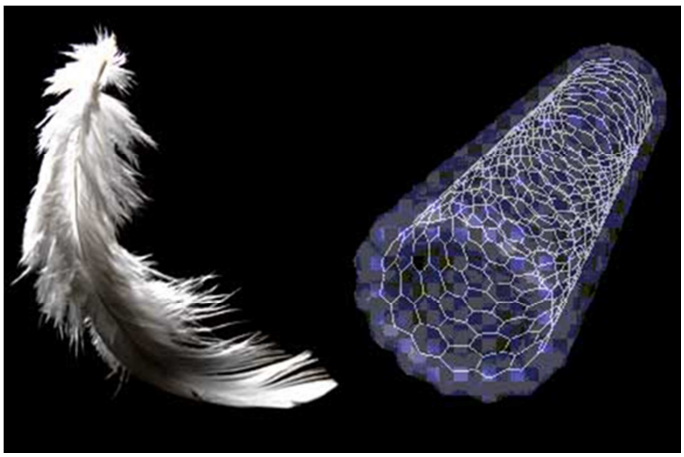


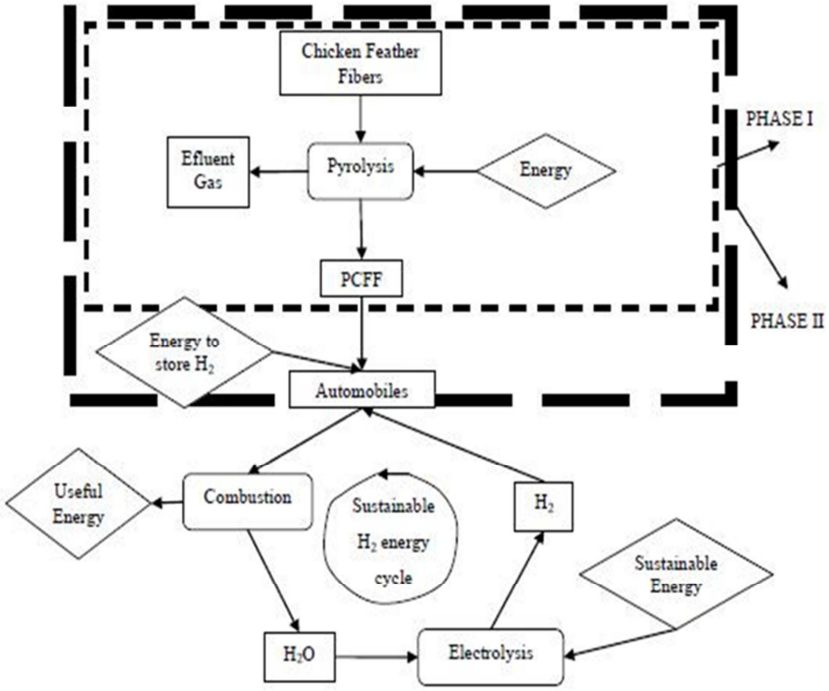
Fig. shows the transformation of feather to nano tube.

Pyrolysis process is applied to the chicken feather meal, during which a very high heat without combustion in the absence of oxygen is applied. Those yielded fibers "that are micro-porous, very thin and hollow inside like carbon nanotubes. They formed at 350 degrees Centigrade, and collapsed above 500 C. perfect temperature is yet to be found.

Added advantage of this process is that no lack of chicken-feed is observed, cause of fiber which is taken from the central quill part, which leaves the fluffy feathers available to force-feed livestock. The produced fiber is exceptionally cheap, and the gas tank equipment weighs around $200 on your pocket.

Using carbonized chicken feathers would only add about $200 to the price of a car. By comparison, to make a 20-gallon hydrogen fuel tank that uses carbon nanotubes which could cost $5.5 million; one that uses metal hydrides could cost up to $30,000. Roughly, it would take around 75-gallon tank to go 300 miles in a car which uses carbonized chicken feather fibers to store hydrogen. The range is still yet to be improved.

In addition to hydrogen storage, chicken feather fibers find numerous applications into a number of other products including hurricane-resistant roofing, lightweight car parts and bio-based computer circuit boards.



Flow sheet showing chicken feather to hydrogen storage.

CONCLUSION

As we can see there is a huge scope for this branch to further grow up bringing new trends and economical technologies, which would serve the nation, by helping to switch over to biodiesel driven vehicles. They also provide cheaper alternative for hydrogen fuel hold up, which cuts the cost of metal hydride fuel tank drastically. On a long run these can prove very useful applications. Apart from using this, it also finds it's applications in bio based switch boards, light weight car parts, Hurricane resistant roofing, etc. So, we need to rely more on natural waste to make most of the bio materials form the nature.

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