PRODUCTION OF BIOETHANOL FROM AGRICULTURE WASTE

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Abstract

Due to rapid growth in population and industrialization, worldwide ethanol demand increasing continuously. Agriculture Waste such as potato peel waste and corn waste are used as a raw material, because they are renewable resources and attractive feed stock for bio ethanol production. Here, Dust (or) impurities are removed from the raw materials and then drying process is carried out. For the require of minimum particle size milling process in takes place. After the milling process, lingo cellulose is obtained by fermentation process (Time period: 48-72hrs) by using enzyme (Alpha amylase). Finally, lignocellulose undergoes distillation process (Temperature:700C) bioethanol will be produce. Then analyze the sample by using High Performance Liquid Chromatography and analyze the presence and absence of bioethanol in given sample.

Introduction

The pursuits of sources for renewable alternate fuels have always been the mankind's interest. There is a growing concern about the price hikes and environmental problems due to the usage of petrol and diesel. So, it is a necessity that we look up to each and every probable source of energy. Ethanol could be produced from rich sources like corn, sugar beet, sweet sorghum, sweet potato or from the abundant cheap cellulosic feedstock like wheat straw, switch grass, wood etc known as cellulosic ethanol. In order to prevent the use of staple crops from agricultural wastes like corn cobs, corn stover, sorghum stalks and byproducts from sugar industries like sugarcane molasses, bagasse etc… are considered as cheaper sources for production of ethanol. Biofuels are the alternative source which can reduce the dependence on fossil energy sources. Many countries have put their target to develop biofuels as they have potential to reduce more than 80% of GHG emissions. These alternative fuels have already covered 2% of the total transport sector and the expectation is that it will be more promoted and utilized in the near future with technology and researches development. The alternative fuels have several benefits such as reduction of the environmental pollution, decreased emission of GHG, highly abundance of raw materials. Renewable energy sources like biofuels are the main alternatives to overcome the depletion of non-renewable energy (like petroleum, coal, or natural gas to produce fuels, chemicals, materials and power), increasing environmental pollution and increasing greenhouse gases. In biofuel includes bio methanol bioethanol, biohydrogen, biodiesel, vegetable oils, bio-oil, bio-char, biogas and bio-synthetic gas.

Bio Ethanol

Bio ethanol is a form of renewable energy that can be produced from agricultural feedstock. It can be made from very common crops such as hemp, sugarcane, potato, cassava and corn. There would be considerable debate about how useful bio ethanol is in replacing gasoline. Concerns about its production and use relate to increased food prices due to the large amount of arable land required for crops, as well as the energy and pollution balance of the whole cycle of ethanol production, especially from corn. Recent developments with cellulosic ethanol production and commercialization may allay some of these concerns. Alcohol is made by a fermentation, mostly from carbohydrates produced in sugar or starch crops such as corn, sugarcane, sweet potato or sweet sorghum. Cellulosic biomass, derived from non-food sources, such as trees and grasses, is also being developed as a feedstock for ethanol production. Ethanol can be used as a fuel for vehicles in its pure form, but it is usually used as a gasoline additive to increase octane and improve vehicle emissions. Bio ethanol is widely used in the United States and in Brazil. Current plant design does not provide for converting the lignin portion of plant raw materials to fuel components by fermentation. Production of bioethanol from edible agricultural products may cause rise of cost of these crops leading to food insecurity and enhancement in the GHGs. Non- edible agricultural products must be investigated to overcome these problems.

Comparative account of Bioethanol and Gasoline

Gasoline is a hydrocarbon used as fuel in transport sector. It is the by-product of crude oil which obtained after fractional distillation. It is hydrophobic and has a flash point of approximately -45° F, varying with octane rating. Vapour density lies between 3 and 4. It has a specific gravity of 0.72-0.76 and insoluble in water, due to these properties it floats on top of water. The gasoline internal combustion point lies from 280°C to 456° C. The boiling point of gasoline is varied from 37° C to 204° C. The high level of gasoline exposure for long time produced harmful effects to respiratory system (Ameri et al., 2008). Bioethanol is an oxygenated fuel having 35% oxygen. Ethanol reduces particulate and nitrogen oxides (NOX) emission from combustion. Pure ethanol is polar solvent that is water soluble and has 55° F flash point. It is heavier than air vapour due to density of 1.59. The specific gravity of ethanol is 0.79, which means it is lighter than water. It is slightly soluble in water. The toxicity of bioethanol is less than gasoline and after blended with gasoline, utilized as automobile fuels. It reduces use of petroleum oil consequently it increases the oxygen in the fuel, which improve the combustion of gasoline consequently it produces less amount of greenhouse gas emission (Wang et al., 1999). The concentration of blending ethanol with gasoline is 10% bioethanol to 90% gasoline which is known as “E10” and commonly called “gasohol.” for the cause of this project, the chosen cellulosic biomass for the production of ethanol from cellulose is sawdust. The extraction will be done by enzymatic hydrolysis of corn flour to break it down to simple sugars and consequently fermentation of product in the presence of enzymes. Problems encountered in the course of the experiment will be noted, results will be compared to data of extraction of ethanol from the same mass of starch.

Experimental Procedure

Raw Materials

Corn Waste and Potato Peel. Alpha amylase Baker's Yeast (*Saccharomyces cerevisae)*

Figure 1 Potato Peel Waste

Figure 2 Corn Waste

Liquefaction

In a 250ml conical flask, 40g of potato peel waste powder & corn flour of a chosen particle size was added along with 400ml of distilled water. It was cooked at 110°Cfor 30 minutes for sterilize the materials. The gelatinized potato peel was then allowed to cool down followed by the addition of alpha amylase enzyme (4g). The flask was maintained in the stirrer for 2 hours at 90°C and at 150rpm

Figure 3 Liquefaction

Fermentation

Baker's yeast was added (0.1g/g of corn) to the liquefied potato peel. The mixture was allowed to ferment for 48-72 hours at room temperature in an orbital shaker at 150 rpm. During fermentation process glucose converted into ethanol in presence of yeast.

Figure 4 Fermentation

After fermentation, the supernatant liquid was collected and fed into a simple distillation column. The boiling temperature of ethanol is below 70°C hence distillation was carried out around that temperature to facilitate the evaporation of ethanol. The vapour was collected and got condensed by means of the circulation of cold water around the column. The distillate having ethanol was recovered in a conical flask at the other end of the column.

Conclusion

Ethanol production has already been very well established to solve our problems like heavy important fuel prices and harmful emissions of the conventional fuels. India has to overcome its technological lagging and join other countries and optimizing this technology. Many research works has been reviewed in this project along with the solution to the hurdles in every step of the process.

The findings of this work suggest that ethanol can be produced from agricultural waste. There should be the development of an environmentally friendly pretreatment procedure.

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