Bioethanol_1

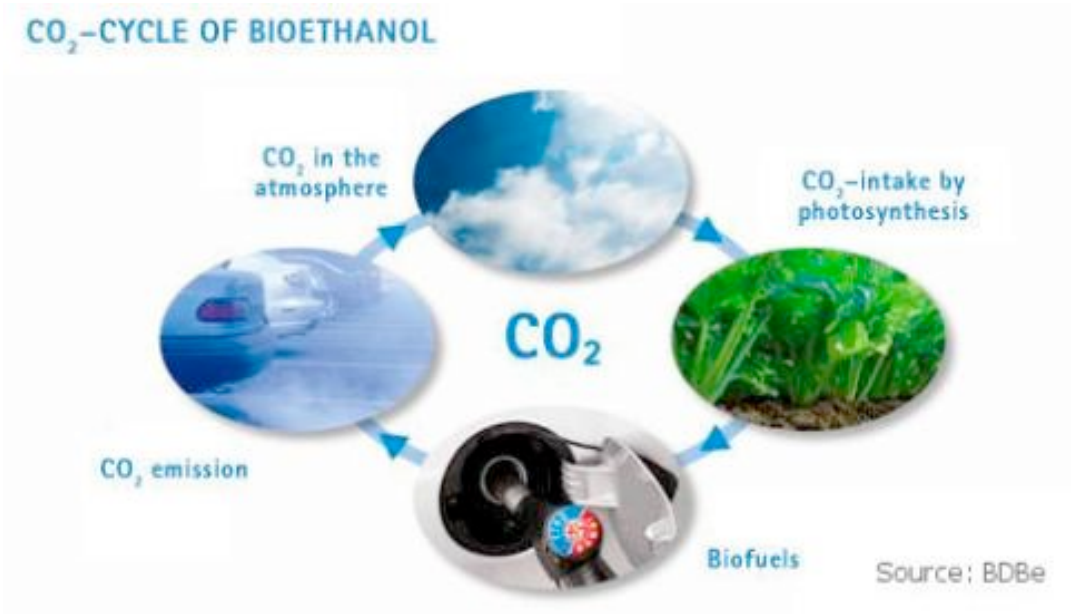
Context:Bioethanol a very strange compound

C_2H_5OH - that is the chemical formula for the compound which, colloquially, is just called "alcohol". To most people it is also known as ethyl alcohol or spirits of wine. It bears the suffix "bio" because it is produced by fermenting biomass that contains sugar and starch - bioethanol is therefore a natural product.
Globally, a total of more than 100 million m^3 of bioethanol were produced in 2010. However, most of it is neither consumed as beverage alcohol nor used as either medicinal or industrial alcohol (glass cleaner, cleaning agents) but has ended up as fuel in the tanks of motor vehicles for some years now. In 2010, it was 85 million m^3 - over 80% of the total world production. World leader in the production of bioethanol is the USA, followed by Brazil.
Bioethanol as an alternative to fossil fuels
There is a lot to be said for bioethanol as

an alternative fuel. The following are the most important advantages:

- Climate protection through fewer greenhouse gas emissions:
  Renewable energy sources such as bioethanol mean that fewer greenhouse gases are produced. Apart from the energy needed to manufacture it, sustainably produced bioethanol, produced from regenerative raw materials, is CO2-neutral. The CO2 released when bioethanol combusts was originally absorbed by photosynthesis by the plants from which it is manufactured as they grew. Our production plant in Wanze, Belgium, for instance, reduces greenhouse gases by 70 % compared to fossil fuels.
- Greater security of supply and less dependence on imports:
  Not only international political tensions but also the developments on the oil markets are projecting this important advantage of bioethanol more and more into the fore: the reserves of many "reliable" oil-producing countries - e.g. EU member states - are dwindling and demand has to be met increasingly from politically less stable regions. It is also to be expected that crude oil exploitation will become still more difficult and costly in the future.
- Conservation of fossil resources:
  Each litre of bioethanol produced from regenerative raw materials means a similar saving in fossil fuels such as petrol and diesel produced from finite resources.
- **Innovative new industry offering important potential for rural areas:**
  The German economy and the public purse benefit from the emergence of a new domestic bioethanol industry through the value added, new jobs and tax revenues it creates. It also opens up new outlets for farmers.
- **More efficient than conventional fuels:**
  Bioethanol scores here thanks to its beneficial chemical properties. It has a considerably higher octane rating than petrol, is virtually free of sulphur and is biologically degradable.

http://www.cropenergies.com/en/Bioethanol/

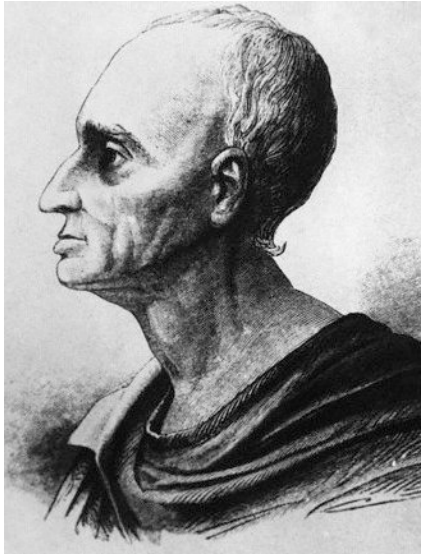


Food & Animal feed

In the production of bioethanol from starch-containing cereals and sugar syrups all the raw materials are fully utilised. Besides bioethanol, various co-products are manufactured, which CropEnergies processes and markets as food and animal feed products. The next-generation bioethanol plant in Wanze, Belgium, produces wheat gluten for the food and animal feed industry in addition to bioethanol.
Other protein animal feeds are produced as co-products. ProtiGrain®, a high-grade dry stillage product (DDGS, Distillers' Dried Grains with Solubles), is produced by drying and pelletization in Zeitz. ProtiGrain® is a storable protein animal feed that is marketed throughout Europe today. ProtiWanze®, a liquid protein animal feed (CDS, Condensed Distiller's Solubles) that is particularly suitable for feeding ruminants and pigs, is produced in Wanze.

Sugar beet

Sugar or sugar syrup extracted from sugar beet is highly suitable for the production of bioethanol. Unlike cereals, however, sugar beet cannot be stored for longer periods. In Europe, sugar beet processing takes place in the autumn in a campaign that lasts about 100 days. So-called thick juice – an intermediate product in the manufacture of sugar – can be stored for the whole year and is available in the sugar factory for the production of white sugar or as a raw material for the production of bioethanol.
For centuries people in Europe had to rely on honey, fruit sweetening or cane sugar for sweetening food and drink. In 1747, the chemist Andreas Markgraf



discovered that the coveted luxury food and food additive could also be extracted from sugar beet.
Markgraf’s student Franz Carl Achard then created the foundations for the industrial production of sugar from beet and in 1802 opened the first beet sugar factory in Europe. Since about 1850, sugar has been produced in Europe from sugar beet on a large scale.

Botanically, sugar beet belongs to the goosefoot family (Chenopodiaceae). Its original form is believed to be the sea beet. The sugar beet is very demanding as to soil and climate, and thrives best on deep, rich soils with an ample supply of water. In Germany, sugar beet is harvested in the late autumn, with yields ranging from 50 to 90 tonnes per hectare. The sugar content of the beet is in the region of 16-20%. The beet foliage is either used as animal feed, or may be left on the field as compost, while the beets are cut into chips in the sugar factory. These are then soaked in water and heated. The raw juice produced is purified and concentrated into thick juice. The thick juice, with a sugar content of around 63%, can be used to produce sugar or bioethanol. For the production of sugar the thick juice is boiled and separated from the syrup in centrifuges. For the production of bioethanol, the thick juice can be fermented directly with the aid of yeasts.

Applications of bioethanol
Bioethanol and gasoline: two types of possible incorporation
Currently in Europe, part of the gasoline already contains bioethanol or ingredients made by it. Generally, consumers do not even know it. European standard EN 228 regulates the chemical properties that different grades of gasoline may have and what ingredients they may contain. It also allows the addition of ethanol in several modes:

15% volume of ETBE
To date, the first use of bioethanol in Europe is done via ETBE (ethyl tertiary butyl ether). ETBE is composed of about 47% ethanol and 53% isobutylene and is used as an additive to gasoline to improve antiknock properties. Particular, it replaces MTBE (methyl tertiary butyl ether), which for example is banned in the United States because of its unsatisfactory environmental characteristics. In Europe, MTBE is increasingly replaced by ETBE, which contributes to the dissemination of a fuel produced from renewable raw materials. In Europe, gasoline may contain up to 15% vol. ETBE.

5% volume of bioethanol
Accordance with EN 228, each liter of gasoline coming out of a gas pump at the service station may contain up to 5% volume of ethanol. This fuel is called E5. In Europe, all vehicles with internal combustion engine adapted for the use of this fuel. If the aims of the EU biofuel are met, we can expect that the direct addition of ethanol to gasoline increases gradually in the coming years. With the redesign of the European standard on fuel in April 2009, the European Union authorized the direct addition of 10% volume of ethanol in

gasoline. This is possible through the establishment of a new fuel, E10. Right out of the norm, France has implemented immediately by introducing a measure of E10 across the country.

Flexible fuel vehicles running on gasoline and / or bioethanol
In several European countries, mixtures of E85 bioethanol contain a proportion of about 85% and can be used in vehicles specially equipped to work with these mixtures. These vehicles are called "Flexible Fuel Vehicle" (FFV).
FFVs are vehicles with an engine, in Europe, can be operated using conventional gasoline and gasoline blends of bioethanol and bioethanol in a proportion up to 85% with modified relatively simple technique.

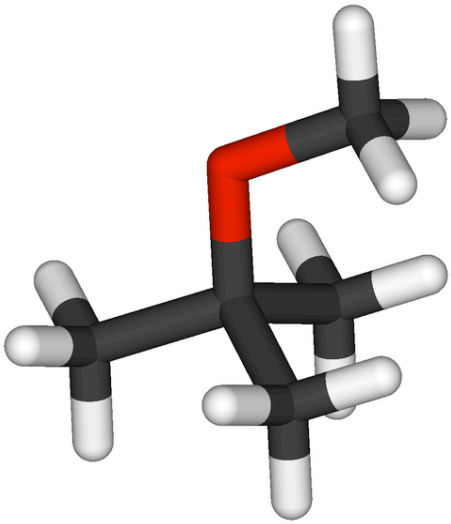
For users, this is an exceptional flexibility, given that according to the price and availability, he can choose between different types of fuel. Mobility is therefore guaranteed, even during the transition phase during which there would be no national network of service stations selling E85, since it can always refuel with the regular gasoline.
For now, the implementation of this technology is not planned at the local level but it is obviously a step that Belgium may consider the medium term. Several carmakers already market in Europe technology vehicles "Flexible fuel".
For technical reasons, it is not advisable to use 100% ethanol in our temperate climates. That is why the E85 is used in Europe. The addition of gasoline improves cold starting characteristics, especially in winter. The use of bioethanol E85 at the national level is the main potential source of reduced dependence on fossil fuels.

Brazil and the United States, FFVs have become a regular streetscape. In Brazil, only vehicles that use ethanol as fuel has a long tradition behind them. They are on the Brazilian market since the 80 ', although these vehicles are actually increasingly squeezed out by the FFV. In the U.S., FFVs are also widespread: about five million such vehicles plying the American roads.
In Europe, for cons, with the exception of Sweden, the FFV is not yet widespread.

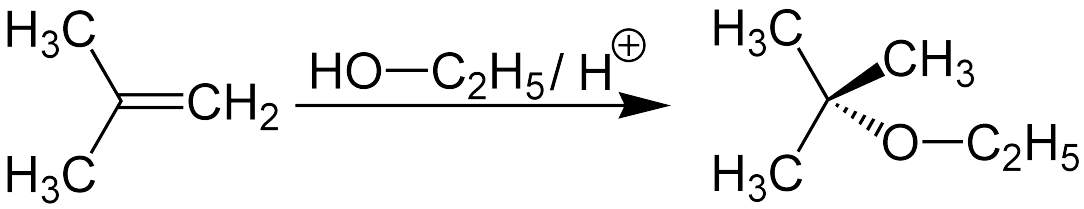
problem

1°) give the equation of alcoholic fermentation with glucose?

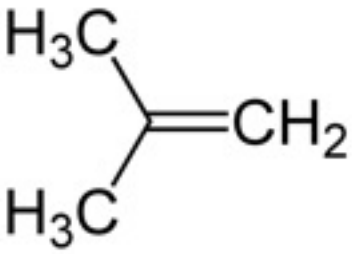
2°) Give «total formula» of the molecule (see images)

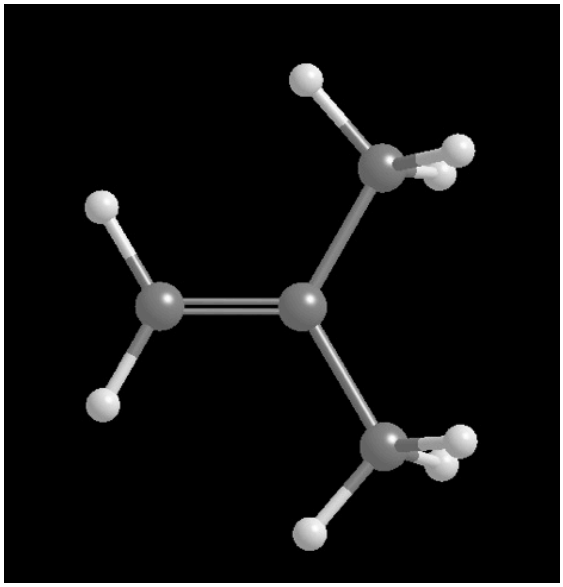


3°) What is the role of the H^+?



4°)Give the name of the reactif ?





5°) Explain why the bonds between carbon are not the same? Why the double bond is shorter?