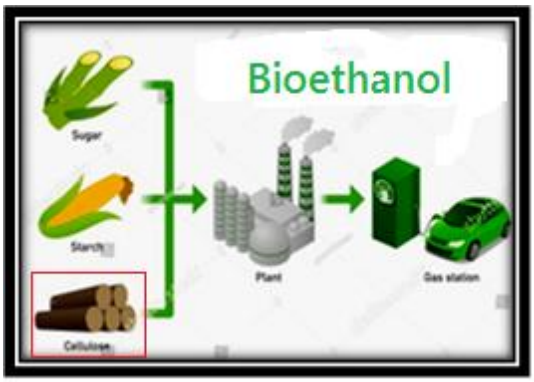
Bioethanol from waste paper

A. Main topics



- Exploitation of wastes with high cellulose content (e.g. used paper) as feedstock for the production of ethanol
- importance of processes commonly occurring in nature (digestion by enzymes and fermentation) in the circular economy world

B. targeted audience

- 14-19 years old students

C. Key concepts

- Recycling and reusing
- Versatility of wastes with high cellulose content
- Importance of wastes with high cellulose content in the circular economy world
- Processes commonly occurring in nature (digestion by enzymes and fermentation) used for the production of biofuels

D. Experimental activity

In this experiment, used paper is the cellulosic material selected as feedstock for the production of ethanol. Paper is first pretreated (chopped and heated), digested with cellulase enzyme and then fermented with brewer's yeast, finally leading to the formation of ethanol, whose occurrence can be monitored using a breathalyzer. The aim of this activity is that the students see first-hand how daily wastes can be easily transformed into very useful products.
This toolkit, written both in English and in Italian, is very comprehensive and the activities can be carried out by participants from 14 to 19 years old. The deepening of the topics related to the experiment may be done according to the age of the participants.

E. Toolkit material

- Small blender (also a domestic one)
- disposable graduated plastic pipettes
- disposable plastic spatula

This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation

- 5-10 vials (5-10 ml)
- cellulase enzyme
- brewer´s yeast (from grocery store/supermarket)
- 2 beakers (250 ml)
- hotplate
- oven/heater able to reach a temperature around 35 °C
- 1 ethanol sensor (ethanol sensors or breathalyzers can be purchased for example through Amazon for approximately 40-95 €, depending on the precision and optionals).

F. RM Tutors

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