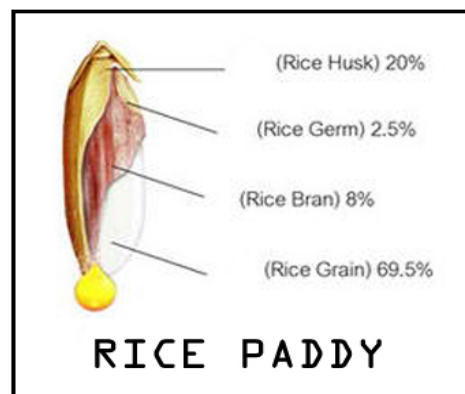


Evaluation of the potential for hydrogen production using rice husk as substrate and a mixed microbiota (microbial consortia) as biological agent

Brazil is the biggest producer of rice in the world outside of Asia. The production is around 15 million tons of rice a year. Rice hulls are the coatings of seeds, or grains, of rice. The husk protects the seed during the growing season. It consist mostly of hard materials, including opaline silica and lignin. The hull is mostly indigestible to humans. The pretreatment used for the experiment of hydrogen production was the heat pretreatment also called Autoclaving. For this the Rice Husk was heated until 80° for 15 min.



Later on the now heated and shredded husk is submerged into distilled water with 2 g of enzyme. This enzyme is the cellulase.

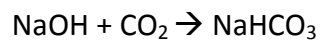
Step 1: In the first step the Inoculum is put into a little container looking upwards. Into this container we put the pretreated rice husk. The inoculum itself consist out of the bacteria culture and substrate. The inoculum works

anaerobically and doesn't needs light to function. The container is put in a heating and movement device. In this device the container lays in water with 35° Celsius and is moved front and back 24 hours a day. The gas produced here flows through the blue tube into step 2.



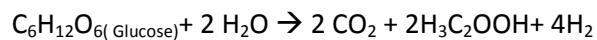
Step 2: Behind the heating machine of part of step 1 is another container that is empty. This container is simply used as a buffer for the case that the pressure changed due to a leak or any unexpected occurrence. This helps to not destroy the bacterial culture because of the liquid in step 3 that could flow into the flask 1.

Step 3: The gas produced in step 1 that passed through step 2 stay in the container looking downwards of step 3. The container contains NaOH. This liquid is used for the reaction with CO₂ and with this clean the consistency of the final gas.



Step 4: The pressure that is produced through the gas flowing into the container of step 3 the liquid is pushed through the tube and fills the measuring cylinder of step 4. The amount of pushed out liquid represents the amount of CO₂ free gas produced. The pushed out liquid is disposed in a special container for a special use later.

The hydrogen production relays on simple chemical reactions. The problem relays mostly on the not uniform composition of the rice husk.



This price is only for the production of the hydrogen itself, without the tank that its cost were valued around 20 €. For this 140 € must be produced 1948,8 liter → 174 g Hydrogen.

This price will depend of the amount of enzyme used in the production because it's the biggest cost driver in the process.