EERA Bioenergy Workshop
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Fermentative hydrogen production from microalgal biomass and agricultural wastes

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Renewable, sustainable and carbon-neutral energy production is needed to deal with the challenges of the currently growing energy demand and deleterious climate changes. Hydrogen (H_2) is presently seen as an ideal future energy carrier with technical, socio-economic and environmental benefits. H_2 can be produced through biological conversion by photosynthesis, photo-heterotrophic and dark fermentation. The interest in biological hydrogen (bioH_2) production has recently increased, as the traditional ways of H_2 production are still costly and display a negative environmental impact.
The research work on bioH_2 production conducted at UB-LNEG targets the use of the most diverse feedstock biomass, process optimization and, whenever possible, integration under an energy-oriented biorefinery pathway. Microalgal biomass and agricultural wastes, such as carob pulp and chestnut shells, are excellent examples of non-food renewable biomass that we have already tested as potential feedstock for bioH2 production. As biomass, microalgae are highly desirable since they are photosynthetic organisms with a very fast growth rate in comparison to higher plants, and their production does not require arable land or potable water. Some microalgae are able to store large amounts of oil or sugars, prime materials for the production of biofuels and bulk-chemicals. Carob pulp is the fruit without seeds of the carob tree (*Ceratonia siliqua* L.), an evergreen tree typical from the Mediterranean countries. It represents about 90% of the total dry weight of the carob fruit and it contains a very high percentage of readily soluble, fermentable sugars (up to 54% w/w). Chestnut shells are the agronomic waste generated from the peeling process of the chestnut fruit. This agronomic residue contains about 36% sugars in the form of polysaccharides, which represent an interesting exploitable source for the production of fermentable monosaccharides. In this presentation the major results obtained by using these biomass feedstock as fermentation substrate for bioH_2 production will be summarized. Our future goals include the development of tailored microbial blends towards more efficient carbon conversions, and the search for more efficient integrative schemes of biofuels and bioelectricity production.