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Title of the poster:
Effects of hydrogen partial pressure on fermentative biohydrogen production by a newly isolated chemotropic bacterium of the genus *Clostridium*.

Abstract:
Hydrogen is widely considered as the most promising energetic carrier since the utilization of hydrogen, either via combustion or via fuel cells, results in pure water. At an industrial scale, steam reformation of methane is currently the major hydrogen producing process. But it may also be intensively produced from renewable biomass. Indeed, fermentative production of hydrogen from renewable biomass using anaerobic bacteria could at least partially reduce our dependence on fossil fuel, decrease the carbon dioxide emissions and produce usable bioenergy. It offers the potential production of usable hydrogen from a variety of renewable resources such as carbohydrates from agriculture or agro-food industries. It is also a promising way to recycle waste coming out of these types of industries.
This technology is based on anaerobic fermentation, called dark fermentation, by chemotrophic bacteria. The investigations carried out at CWBI involve selection and characterization of bacteria strains able to produce biohydrogen efficiently and with a wide range of substrate. The selected strains at the laboratory has been characterised as *Clostridium* sp.
To produce hydrogen at high yield and high production rate, the biotechnological processes need to be further optimized and highly efficient bioreactors must be designed. At CWBI, a new reactor, called "horizontal rotative cylinder bioreactor" allows the production of biohydrogen from glucose with our *Clostridium* sp. strain with a high yield and production rate. This reactor, working continuously, has an internal volume of 2.3l but a working volume (liquid phase) of 300ml. Firstly, it enhances the hydrogen production rate by partially fixing the bacteria on the porous cylinder and thus increasing the cell concentration in the bioreactor. Secondly, the rotative cylinder enables efficient gas transfer (mainly hydrogen) from the liquid phase where it is produced by the bacteria. This is an important way to enhance hydrogen production yield by allowing the bacteria metabolism to shift in a fermentation type that produces more hydrogen. This was confirmed by increasing or decreasing the total pressure in the bioreactor and observing the influence of hydrogen production.
The liquid to gas hydrogen transfer is possibly an important factor to enhance the biogas production. Our investigation confirmed this by testing different liquid to gas transfer condition in BHP test (batch fermentation in 250ml vials).This was made either by decreasing total and partial pressure, or by increasing the mixing state of the media.
Our work concludes the importance of providing good liquid to gas transfers in biohydrogen producing reactors to enhance the hydrogen production and reach higher yields.