Biohydrogen production from rice straw using a designed single chambered microbial electrolytic cell reactor

Piyush Parkhey
National Institute of Technology, India

A single chambered Microbial Electrolytic Cell Reactor (MECR) of working volume 2 L was designed using acrylic plastic sheets for hydrogen production by electrohydrogenesis. Initially, *Lysinibacillus sphaericus*, an aerobic cellulolytic bacterium was isolated from dairy wastewater and its cellulolytic potential was characterized. The isolate produced 5.16±0.07 U/ml CMCase. Rice straw was procured from rice fields and pretreated with microwave assisted alkali pretreatment method. Cellulose recovery was calculated to be 82.08±0.3%. Cellulase preparation was used to hydrolyze the pretreated rice straw. A percent saccharification of 69.5% was observed. HPLC analysis revealed that hydrolysate produced at optimal conditions of saccharification constituted 70.8% of glucose. The hydrolysate thus obtained was used as feed in the designed MECR for hydrogen production by the process of electrohydrogenesis. Graphite sheet were used as anode and a stainless-steel mesh was used as cathode in the reactor. *Shewanella putrefaciens* (MTCC 3525) was used as exoelectrogen to oxidize rice straw hydrolysate in the reactor for electrohydrogenesis. The maximum H₂ yield of 695 ml H₂ g⁻¹ COD removal with an energy efficiency of 65% was recorded.

Biography

Piyush Parkhey has completed his PhD in 2015 from the Department of Biotechnology at National Institute of Technology, Raipur. He has received the prestigious INSPIRE-AORC Fellowship in the year 2010 from Department of Science and Technology, Government of India. His PhD title was “Biological production of Hydrogen: Development of a two-step bioprocess for conversion of rice straw into hydrogen”. During the course of his PhD, he has published 5 research papers and presented his work in 3 international conferences. He has also filed a provisional patent in 2014 titled “A Continuous Microbial electrolytic cell reactor (CMECR) for biohydrogen production using lignocellulosic hydrolysate by electrohydrogenesis”.

piyushparkhey@gmail.com