NR> Vol.2 No.1, March 2011

OPEN ACCESS

Optimization of Photo-Hydrogen Production by Immobilized Rhodopseudomonas Faecalis RLD-53

PDF (Size:487KB) PP. 1-7 DOI: 10.4236/nr.2011.21001

Author(s)

Bing-Feng Liu, Guo-Jun Xie, Wan-Qian Guo, Jie Ding, Nan-Qi Ren

ABSTRACT

In this work, the optimization of hydrogen production by photo-fermentation bacteria immobilized on agar gel granule was systematic investigated in batch culture. Experiment focus on the effect of some important affecting factors on photo-hydrogen production. Results indicated that immobilized Rhodopseudomonas faecalis RLD-53 exhibited the highest hydrogen yield of 3.15 mol H2/mol acetate under follow optimal condition: agar granule diameter of 2.5 mm, inoculum age of 24 h, agar concentration of 2%, biomass of 4 mg/ml in agar and light intensity of 9000 lux. More importantly, immobilized photo-fermentation bacteria not only can enhance hydrogen production but can increase acids-tolerance capacity, even at pH 5.0 hydrogen also was produced, and thus hopefully immobilized photo-fermentation bacteria can be applied in the combination of dark and photo-fermentation for hydrogen production with high yield.

KEYWORDS

Hydrogen Production, Photo-Fermentation, Agar Gel, Immobilized Rhodopseudomonas Faecalis, Acids-Tolerance Capacity

Cite this paper

B. Liu, G. Xie, W. Guo, J. Ding and N. Ren, "Optimization of Photo-Hydrogen Production by Immobilized Rhodopseudomonas Faecalis RLD-53," *Natural Resources*, Vol. 2 No. 1, 2011, pp. 1-7. doi: 10.4236/nr.2011.21001.

References

[1] P. C. Hallenbeck, "Fermentative Hydrogen Production: Principles, Progress and Prognosis," International Journal of Hydrogen Energy, Vol. 34, No. 17, 2009, pp. 7379-7389. doi:10.1016/j.ijhydene.2008.12.080

[2] E. Ozgür, A. E. Mars, B. Peksel, A. Louwerse, M. Yücel, U. Gündüz, P. A. M. Claassen and I. Eroglu, "Biohydrogen Production from Beet Molasses by Sequential Dark and Photo-Fermentation," International Journal of Hydrogen Energy, Vol. 35, No. 2, 2010, pp. 511-517. doi:10.1016/j.ijhydene.2009.10.094

[3] B. F. Liu, N. Q. Ren, D. F. Xing, J. Ding, G. X. Zheng, W. Q. Guo, J. F. Xu and G. J. Xie, "Hydrogen Production by Immobilized R. faecalis RLD-53 Using Soluble Metabolites from Ethanol Fermentation Bacteria E. Harbinense B49," Bioresource Technology, Vol. 100, No. 10, 2009, pp. 2719-2723. doi:10.1016/j.biortech.2008.12.020PMid:19200719

[4] B. F. Liu, N. Q. Ren, G. J. Xie, J. Ding, W. Q. Guo and D. F. Xing, "Enhanced Bio-Hydrogen Production by the Combination of Dark and Photo Fermentation in Batch Culture," Bioresource Technology, Vol. 101, No. 14, 2010, pp. 5325-5329. doi:10.1016/j.biortech.2010.02.024

[5] S. Ozmihci and F. Kargi, "Bio-Hydrogen Production by Photo-Fermentation of Park Fermentation Effluent with Intermittent Feeding and Effluent Removal," International Journal of Hydrogen Energy, Vol. 35, No. 13, 2010, pp. 6674-6680. doi:10.1016/j.ijhydene.2010.04.090

[6] H. Argun and F. Kargi, "Effects of Light Source, Intensity and Lighting Regime on Bio-Hydrogen Production from Ground Wheat Starch by Combined Dark and Photo-Fermentations," International

- Open Special Issues
- Published Special Issues
- Special Issues Guideline

NR Subscription

Most popular papers in NR

About NR News

Frequently Asked Questions

Recommend to Peers

Recommend to Library

Contact Us

Journal of Hydrogen Energy, Vol. 35, No. 4, 2010, pp. 1604-1612. doi:10.1016/j.ijhydene.2009.12.033

[7] Y. C. Lo, C. Y. Chen, C. M. Lee and J. S. Chang, "Sequential Dark-Photo Fermentation and Autotrophic Microalgal Growth for High-Yield and CO2-free BioHydrogen Production," International Journal of Hydrogen Energy, Vol. 35, No. 20, 2010, pp.10944-10953. doi:10.1016/j.ijhydene.2010.07.090

[8] B. Uyar, I. Eroglu, M. Yücel and U. Gündüz, "Photo Fermentative Hydrogen Production from Volatile Fatty Acids Present in Dark Fermentation Effluents," Int J Hydrogen Energy, Vol. 34, No. 10, 2009, pp. 4517-4523. doi:10.1016/j.ijhydene.2008.07.057

[9] S. K. S. Patel, H. J. Purohit and V. C. Kalia, "Dark Fermentative Hydrogen Production by Defined Mixed Microbial Cultures Immobilized on Ligno-Cellulosic Waste Materials," International Journal of Hydrogen Energy, Vol. 35, No. 19, 2010, pp. 10674-10681. doi:10.1016/j.ijhydene.2010.03.025

[10] J. H. Jo, D. S. Lee, D. Park and J. M. Park, "Biological Hydrogen Production by Immobilized Cells of Clostridium Tyrobutyricum JM1 Isolated from a Food Waste Treatment Process," Bioresource Technology, Vol. 35, No. 19, 2008, pp. 6666-6672. doi:10.1016/j.biortech.2007.11.067

[11] T. Matsunaga, I, Karube and S. Suzuki, "Some Observations on Immobilized Hydrogen-Producing Bacteria: Behavior of Hydrogen in Gel Membranes," Biotechnology Bioengineering, Vol. 22, No. 12, 1980, pp. 2607-2615. doi:10.1002/bit.260221209

[12] J. O. Kim, Y. H. Kim, J. Y. Ryu, B. K. Song, I. H. Kim and S. H. Yeom, "Immobilization Methods for Continuous Hydrogen Gas Production Biofilm Formation Versus Granulation," Process Biochemistry, Vol. 40, No. 3-4, 2005, pp. 1331-1337. doi:10.1016/j.procbio.2004.06.008

[13] H. Yokoi, T. Tokushige, J. Hirose, S. Hayashi and Y. Takasaki, "Hydrogen Production by Immobilized Cells of Aciduric Enterobacter Aerogenes Strain HO-39," Journal of Fermentation and Bioengineering, Vol. 83, No. 5, 1997, pp. 481-484. doi:10.1016/S0922-338X(97)83006-1

[14] S. Sawayama, K. K. Rao and D. Hall, "Immobilization of Rhodobacter capsulatus on Cellulose Beads and Water Treatment Using a Photobioreactor," Journal of Fermentation and Bioengineering, Vol. 86, No. 5, 1998, pp. 517-520. doi:10.1016/S0922-338X(98)80164-5

[15] X. Tian, Q. Liao, W. Liu, Y. Z. Wang, X. Zhu, J. Li and H. Wang, "Photo-Hydrogen Production Rate of A PVA-Boric Acid Gel Granule Containing Immobilized Photosynthetic Bacteria Cells," International Journal of Hydrogen Energy, Vol. 34, No. 11, 2009, pp. 4708-4717. doi:10.1016/j.ijhydene.2009.03.042

[16] N. Q. Ren, B. F. Liu, J. Ding and G. J. Xie, "Hydrogen Production with R. faecalis RLD-53 Isolated from Freshwater Pond Sludge," Bioresource Technology, Vol. 100, No. 1, 2009, pp. 484-487. doi:10.1016/j.biortech.2008.05.009

[17] B. F. Liu, N. Q. Ren, J. Ding, G. J. Xie and W. Q. Guo, "The Effect of Ni2+, Fe2+ and Mg2+ Concentration on Photo-Hydrogen Production by Rhodopseudomonas faecalis RLD-53," International Journal of Hydrogen Energy, Vol. 34, No. 2, 2009, pp. 721-726. doi:10.1016/j.ijhydene.2008.11.033

[18] P. Felten, H. Zürrer and R. Bachofen, "Production of Molecular Hydrogen with Immobilized Cells of