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Effect of pH, temperature and agitation on thermophilic biohydrogen production using immobilized cells on carbon composites (GAC-NiFe3O4)

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Abstract
Carbon composites-immobilized cell was utilized to enhance biohydrogen production. The initial pH, temperature and agitation effect was studied using the one-factor-at-a-time (OFAT) method. The optimal initial pH obtained was at pH 6.0 with hydrogen yield (HY) of 2.66 ± 0.09 mol H2/mol sugar, correlating with Gompertz constant of Hm = 974.99 mL, Rm = 17.90 mL/h and λ = 1.70 h. At 60 °C, the highest HY was obtained at 2.75 ± 0.11 mol H2/mol sugar. These corresponded to the Gompertz constant of Hm = 934.58 mL, Rm = 18.78 mL/h and λ = 1.89 h. The optimal agitation obtained was at 120 rpm, attaining the highest HY of 3.44 ± 0.54 mol H2/mol sugar, corresponding to the Gompertz constant of Hm = 1054.86 mL, Rm = 24.37 mL/h and λ = 3.90 h. The rRNA sequencing result revealed that the predominant species in the study was Thermoanaerobacterium. This study provides critical insight into process control conditions on biohydrogen production. © 2024 Elsevier B.V.

Author Keywords
Dark fermentation; Granular activated carbon nanocomposites; Immobilized cell; Process parameter; Thermophilic biohydrogen production

Index Keywords
Carbon carbon composites, Cell culture, Cells, Hydrogen production, pH effects, RNA; Bio-hydrogen production, Carbon nanocomposite, Dark fermentation, Granular activated carbon nanocomposite, Granular activated carbons, Hydrogen yields, Immobilised Cells, Process parameters, Thermophilic biohydrogen production, Thermophilics; Activated carbon

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