BIOLOGICAL HYDROGEN PRODUCTION FROM CO: BIOREACTOR PERFORMANCE

Abstract

This paper presents an alternative solution to the current problem faced by the world; diminishing of fossil fuel. Bioconversion of synthesis gas to hydrogen as clean fuel was catalyzed by a photosynthetic bacterium, *Rhodospirillum rubrum*. The clean fuel production was biologically mediated by the water–gas shift reaction in a 2 l bioreactor. The work performed was on agitation effects on hydrogen production, K_La and power consumption. The results show that 500 rpm was the suitable agitation rate to be employed. The hydrogen production was optimized at 0.44 ± 0.023 atm giving a K_La of 86.4 ± 3.5 h^{-1}. The production rate was 9.6 mmol H_2/h. The maximum light conversion efficiency at agitation speed of 800 rpm, light intensity of 500 lux (732 kW/m^2) and 4 g/l inlet acetate concentration was about 10.84 ± 1.73%. At this condition, the maximum CO conversion efficiency was found to be 81 ± 5.6%. The ratio of power per volume was calculated to be 322.30 ± 12.14 kW/m^3 and foaming problem was successfully avoided. The corresponding power consumption was estimated to be about 0.64 ± 0.03 kW, while the output hydrogen energy was determined to be 643.2 ± 26 kW. A prolonged operation of continuous hydrogen production employing a microsparger showed stable behaviour for a duration of 27 days.