

Hydrogen production in the S-deprivation condition using *Chlamydomonas reinhardtii*: effects of culture parameters

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The objective of this work is to optimize hydrogen production using the green algal *Chlamydomonas reinhardtii* in the sulfur deprivation condition. To produce hydrogen by the green algae is required hydrogenase activation. But hydrogenase having severe O₂ sensitivity are inactivated by photosynthetic O₂ evolution. This problem can overcome to separate between the simultaneous photosynthetic O₂ and H₂ gas evolution(two-stage) by the sulfur deprivation in medium. Two-stage process happen first photosynthetic O₂ evolution and carbon accumulation(stage 1), followed H₂ evolution by consumption of endogenous substrate when the green algae are incubated under anaerobic condition(stage 2). The experimental method is first to cultivate cells in TAP medium and followed to make the sulfur deprivation condition after washing 5-6 times with TAP-S medium. After 30 h of incubation in the sulfur deprivation, the O₂ evolution activity by photosynthesis falls below the O₂ uptake activity by respiration. Sulfur deprivation algal cultures evolved hydrogen gas for 3 days under continuous illumination. This work investigated the hydrogen production effect with cell density and residue sulfur concentration in medium.