

Biological Hydrogen Production Progress and Prospects

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Hydrogen (H₂) has the highest gravimetric energy density among previously known fuels and is compatible with electrochemical and combustion process for energy conversion without evolving carbon-based emissions that lead to environmental pollution and green house effect. Numerous methodologies have been developed for effective hydrogen production. Among them, the biological hydrogen production has gained attention because hydrogen can be produced by cellular metabolism under the presence of water and sunlight. Green algae is one of the microorganisms, which can produce hydrogen. Green algae has photosynthetic system like that of plants, therefore they can produce hydrogen using carbon dioxide as carbon source, sunlight as energy source, and water as electron donor. Hydrogen production by the green algae is catalyzed by hydrogenase, an enzyme that has activity only under anaerobic condition. Hydrogenase activation is prerequisite to produce hydrogen by the green algae. But the hydrogenase has severe oxygen sensitivity and is easily inactivated by photosynthetic oxygen evolution. This problem can be overcome by separating photosynthetic oxygen evolution and anaerobic hydrogen production.