

Research of hydrogen collection from organic matter in dark fermentation process

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Biological production of hydrogen by bacterial anaerobic fermentation of widely available renewable resources is a promising and advantageous area. Currently hydrogen from liquid culture medium is collected in the gaseous state, since dissolved hydrogen is in equilibrium with gas phase and tends to release from solution if partial pressure of H₂ decreases (Pray, 1952). Hydrogen over-saturation phenomena in liquid phase during dark fermentation process occur (Klepere et al., 2011). One alternative for hydrogen storage, that is also the safest method, is hydrogen storage in metal hydride alloys. We investigated various powdered metals and alloys (Pd, LaNi₅, AB₅, AB₂) forming hydrides to test for their facility to collect hydrogen directly from liquid phase. Differential thermogravimetric method, vacuum extraction and mass spectrometry were used to measure mass changes and hydrogen concentration produced by anaerobic bacteria fermentation process using crude glycerol as substrate. SEM analysis demonstrated that bacteria attached to the material surface. Storage effect was strongest with Pd, AB₅ and AB₂. It appeared that if the sample contained metal that absorbs hydrogen released in fermentation process, the concentration of hydrogen in the gaseous phase at the end of the process will be lower, total amount of captured hydrogen was higher comparing to samples without metal hydride alloys.

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References

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