

## Determination of Economic and Ecological Potential of Bio Hydrogen Generated through Dark Photosynthesis Process

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**Abstract :** The use of biogenic residues for the biotechnological production of chemical energy carriers for electricity and heat generation as well as for mobile applications is an important lever for the shift away from fossil fuels towards a carbon dioxide neutral post-fossil future. A multitude of promising biotechnological processes needs, therefore, to be compared against each other. For this purpose, a multi-objective target system and a corresponding methodology for the evaluation of the underlying key figures are presented in this paper, which can serve as a basis for decisionmaking for companies and promotional policy measures. The methodology considers in this paper the economic and ecological potential of bio-hydrogen production using the example of hydrogen production from fruit and milk production waste with the purple bacterium *R. rubrum* (so-called dark photosynthesis process) for the first time. The substrate used in this cost-effective and scalable process is fructose from waste material and waste deposits. Based on an estimation of the biomass potential of such fructose residues, the new methodology is used to compare different scenarios for the production and usage of bio-hydrogen through the considered process. In conclusion, this paper presents, at the example of the promising dark photosynthesis process, a methodology to evaluate the ecological and economic potential of biotechnological production of bio-hydrogen from residues and waste.

**Keywords :** biofuel, hydrogen, *R. rubrum*, bioenergy

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