

***Optimization of Biohydrogen Production Through Dark Fermentation Method
of Plantain Peel Waste Using Nanomaterials as Catalysts***
Zeni Ulma, S.ST., M.Eng. (Undergraduate Thesis Supervisor)

Nurwahidah Istiqomah
*Study Program of Renewable Energy Engineering
Majoring of Engineering*

ABSTRACT

Utilization of clean renewable energy resources should be used to replace fossil fuels in overcoming environmental problems. To address the growing demand for energy in line with the increasing population worldwide, the development of alternative energy sources that are easily obtainable and renewable is necessary due to concerns about greenhouse gas emissions and oil limitations. One solution to produce environmentally friendly energy is to convert biomass into biohydrogen. This study uses plantain peel waste as the main raw material (substrate) with the addition of cow dung and tofu waste as a starter. This research uses nanomaterial catalyst to increase hydrogen yield by using the dark fermentation method. The research methods used include literature study, preparation of tools and materials, preparation of nanomaterial catalysts, mixed inoculum, substrate preparation, biohydrogen production, and biohydrogen analysis. The experimental design in this study uses two variables, namely pH variation and nanomaterial catalyst concentration. The pH variations used were pH 5, 6, and 7. The catalyst concentration variations were (10, 20, and 30) mg/L. The experimental design used is Response Surface Method (RSM) and data processing using Minitab 21 software. The response optimizer curve shows that the optimum condition for the potential of plantain peel waste as a biohydrogen raw material with the addition of nanomaterial catalyst is pH 7 with a nanomaterial concentration of 10 mg/L. The test results of volatile solid content show that the optimum condition is at pH 7 with a nanomaterial concentration of 10mg/L. This research is expected to provide alternative solutions in overcoming environmental problems and open opportunities for sustainable utilization of organic waste and can help research related to alternative fuels as a substitute for fossil fuels.

Keywords: Biohydrogen, dark fermentation, nanomaterial catalyst, banana peel.