BUTLEROV HERITAGE

Butlerov Communications C
Advances in Biochemistry & Technologies
ISSN 2074-0948 (print)

2021. Vol.2, No.3, Id.13.
Journal Homepage: https://c-journal.butlerov.com/

Thematic section: Biochemical Research.
Subsection: Biotechnology.

Short Communication

The Reference Object Identifier – ROI-jbc-C/21-2-3-13
The Digital Object Identifier – DOI: 10.37952/ROI-jbc-C/21-2-3-13
Received 12 August 2021; Accepted 15 August 2021

Ethanol Production from cellulosic biomass of municipal solid waste using of enzyme-gold complexes

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Keywords: cellulose, waste paper, bioethanol, gold nanoparticles, hydrolysis.

Abstract

This paper deals with the possibility of fermentation of glucose in bio-ethanol from cellulose of municipal solid waste using bionanocatalyst based on colloidal gold particles. It was suggested that enzyme nanocatalyst increases the enzyme activity and prevents processes of inhibition. These processes arise from impurities, contained in waste and in a content of paper itself, make this process impossible by formation of impurity complexes of a biocidal nature with enzymes which hydrolyses into ethanol. Bionanocatalyst effect is based on rapid adsorption of the enzyme on the active surface of colloidal gold with the formation of a complex.

Bionanocatalyst made by the aqueous extract of yeast with using the gold nanoparticles was added to the previously prepared and purified neutralized cellulose hydrolysate with stirring for several hours. As a result of the study, some samples were selected for analysis. After the conclusion of the study of these samples, expected results were confirmed which were evaluated by the primary content of reducing substances in the hydrolysate and ethanol generation rate. To conclude the fermentation using a complex catalyst on gold nanoparticles the concentration of reducing sugars in the hydrolysate decreased and bio-ethanol content significantly increased as evidenced by the immobilization of gold nanoparticles on the surface of the enzyme, which led to an increase in enzymatic activity.

The use of such bionanocatalyst simplifies the traditional scheme of glucose fermentation in bio-ethanol from cellulosic biomass of municipal solid waste as well as prevents the inhibition from fermentation which expands the ethanol production by minimizing the toxic effect of fermentation inhibitors.

For citation: Darya M. Kuzmina, Ekaterina B. Aronova, Anatoly I. Ginak. Ethanol Production from cellulosic biomass of municipal solid waste using of enzyme-gold

complexes. *Butlerov Communications C.* **2021**. Vol.2, No.3, Id.13. DOI: 10.37952/ROI-jbc-C/21-2-3-13

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