

Nanotechnology for bioenergy production

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Many diverse resources are available to meet the demands for energy but bioenergy is creating an impact on the global energy infrastructure. Bioenergy, as the name suggests, is the renewable energy produced from biological sources involving many ways. The production of bioenergy, such as electricity, heat or biofuels involves both simple and complex processes. Anaerobic digestion is one of the natural processes, which uses microbes to convert the biomass without causing any effects on the environment. But a high level of investments in anaerobic digestion has made the researchers opt for the nanoparticles as heterogeneous catalysts for a successful biorefinery. The methods utilising nanoparticles are cost-effective and process-efficient. Nanomaterials can not only be applied in the process of anaerobic digestion but also transesterification, pyrolysis, gasification and hydrogenation for the production of biofuels. Biogas can be produced by increasing the anaerobic digestion by the usage of iron, cobalt and nickel nanoparticles. Second-generation biofuels can be produced in a cost-effective way by using titanium dioxide, iron oxide, zinc oxide nanoparticles, etc. Magnetic nanoparticles can be used in the production of biogas, bioethanol and biodiesel. Silica and metal oxide nanoparticles can be employed in various stages of algal fuel production. Nanoparticles help to boost fuel performance and enhance combustion properties. Therefore, the potential of nanoparticles in biorefinery processing is believed to be highly promising.

Keywords: Bioenergy, Biofuel, Nanoparticles, Emission, Anaerobic digestion, Biorefineries, Biomass, Environment effects

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