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Utilization of nanomaterials in accelerating the production process of sustainable biofuels

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ABSTRACT

Around 84 % of the global energy needs are met by fossil fuels, notwithstanding their several drawbacks. Dependence on fossil fuels can be reduced when biofuels become more widely used. Compared to fossil fuel, biofuel is substantially less combustible and derived from renewable resources. Biofuel production from non-edible feedstocks can be enhanced by utilizing nanotechnology. Biofuel research to date has produced promising results, but very few recent studies have underlined the use of nanotechnology to enhance the biofuel production process. This study comprehensively reviews the potential use of nanotechnology in improving biofuel production processes. It also highlights the factors that affect nanomaterial performance in the biofuel production process. The nickel oxide (NiO) nanoparticles (NPs) are shown to be highly efficient, with harvesting *Chlorella vulgaris* biomass at an efficiency of 98.75 % in 1 min at pH 7. In terms of cost-effectiveness, naked modified magnetic nanoparticles (MNPs) cost significantly less, ranging from £3-500 to £0.5-108 per kg following nanoparticle reactivation. Due to their toxicity, nanomaterials used in biofuel production systems have several detrimental effects on living organisms, the environment, and the economy. Developing non-toxic nanomaterials, utilizing cheaper nanoparticles, and doing additional research might increase knowledge availability and understanding to address the current issues.