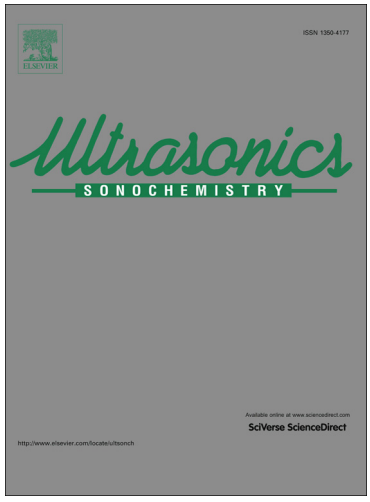

Review

Ultrasound-assisted biological conversion of biomass and waste materials to biofuels: A review

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Ultrasound-assisted biological conversion of biomass and waste materials to biofuels: A review

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Abstract

Ultrasound irradiation has been gaining increasing interests over the years to assist biological conversion of lignocellulosic biomass and waste materials to biofuels. As such, this study reviewed the different effects of sonication on pre-treatment of lignocellulosic biomass and waste materials prior to biofuel production. The mechanisms of ultrasound irradiation as a pre-treatment technique were initially described and the impacts of sonication on disruption of lignocellulosic materials, alteration of the crystalline lattice structure of cellulose molecules, solubilisation of organic matter, reducing sugar production and enzymatic hydrolysis were then reviewed. Subsequently, the influences of ultrasound irradiation on bio-methane, bio-hydrogen and bio-ethanol production were re-evaluated, with most studies reporting enhanced biofuel production from anaerobic digestion or fermentation processes. Nonetheless, despite its positive impacts on biofuel production, sonication was found to be energetically inefficient based on the lab-scale studies reviewed. To conclude, this study reviewed some of the challenges of ultrasound irradiation for enhanced biofuel production while outlining some areas for further research.

Keywords:

Sonication, Ultrasound irradiation, Biofuel, Energy efficiency, Pre-treatment technology, Enzymatic hydrolysis

1. Introduction

Bio-energy has been gaining increasing interests over the years with its contribution for energy production amounting to approximately 10% of global primary energy supply [1]. As a component of bio-energy, biofuels, which can be classified as solid, liquid or gas, can be produced from biological or thermochemical routes from a wide variety of substrates ranging

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