A reactor designed for the ultrasonic stimulation of enzymatic esterification

A., Vartolomei[1*], I., Calinescu [1] I-A., Gavrila,[1] M., Vinatoru[1], T. J., Mason[2]

[1] Faculty of Applied Chemistry and Material Science, University "Politehnica" of Bucharest, 1-7 Gh. Polizu, Bucharest, 011061, Romania

[2] Faculty of Health and Life Sciences, Coventry University, Coventry, UK

email: anamaria111@gmail.com

Abstract

The general interest of industry in more "green" technologies has encouraged a move towards syntheses involving biocatalysts and the search for improvements in such methods. The use of ultrasound has proved to be successful for the intensification of some enzymatic esterification using commercial ultrasonic horns and cleaning baths [1]. An ultrasonic reactor suitable for enzymatic reactions was designed, built and characterized, using as a model the esterification of acetic acid with isoamyl alcohol [2]. The reactor was operated in a loop configuration, with ultrasound working in pulse mode, at a constant temperature and the water produced in the esterification was continuously removed [3]. The efficiency of the reactor was determined in relation to ultrasonic power density (measured by 4-nitrophenol dosimetry), position of ultrasonic horn and temperature. The results show that ultrasound can enhance the process efficiency and also reduce the reaction time. The reactor was assessed in terms of minimizing cavitation activity and maximizing mass transfer.

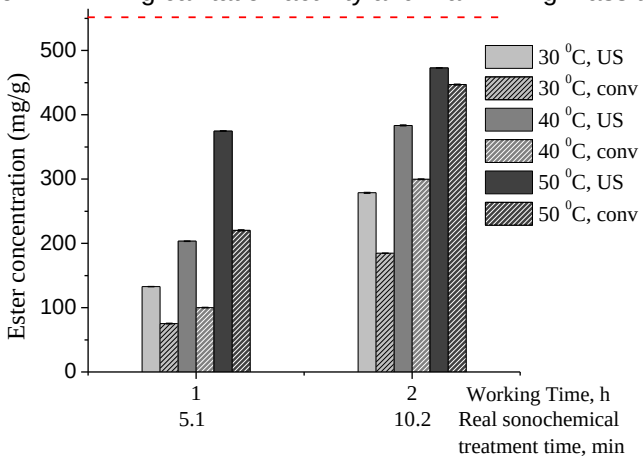

Figure 1. . Ester concentration generated with time for the conventional and US intensified esterification reaction at different reaction temperatures: 30°C, 40°C, 50°C, 0.047 g enzyme/g mixture, pulse: 3on/3off

References

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