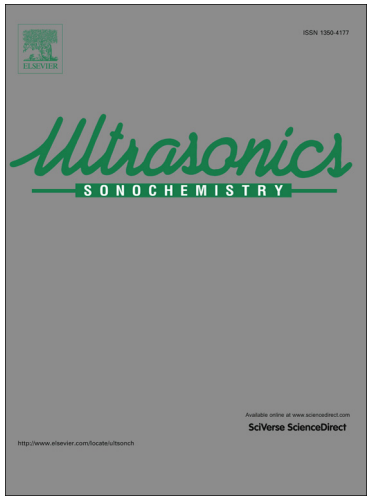

Low frequency ultrasonic-assisted hydrolysis of starch in the presence of α-amylase

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PII: S1350-4177(17)30469-8
DOI: https://doi.org/10.1016/j.ultsonch.2017.10.007
Reference: ULTSON 3911

To appear in: *Ultrasonics Sonochemistry*

Received Date: 17 March 2017
Revised Date: 4 October 2017
Accepted Date: 5 October 2017

Please cite this article as: A. Gaquere-Parker, T. Taylor, R. Hutson, A. Rizzo, A. Folds, S. Crittenden, N. Zahoor, B. Hussein, A. Arruda, Low frequency ultrasonic-assisted hydrolysis of starch in the presence of α-amylase, *Ultrasonics Sonochemistry* (2017), doi: https://doi.org/10.1016/j.ultsonch.2017.10.007

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Abstract

Hydrolysis of starch is an important process in the food industry and in the production of bioethanol or smaller carbohydrate molecules that can be used as starting blocks for chemical synthesis. Such hydrolysis can be enhanced by lowering the pH, heating the reaction mixture or catalyzing the reaction with enzymes. This study reports the effect of sonication on the reaction rate of starch hydrolysis at different temperatures, in the presence or absence of alpha-amylase. Starch Azure, a commercially available potato starch covalently linked with Remazol Brilliant Blue, has been chosen since its hydrolysis releases a blue dye, which concentration can be monitored by UV Vis spectroscopy. Ultrasounds, regardless of experimental conditions, provide the highest reaction rate for such hydrolysis.

Keywords: sonication; starch; hydrolysis; temperature; enzyme; alpha-amylase

1. Introduction

Cavitation is a phenomenon produced when the cohesion forces within a liquid are disrupted, during sonication for instance [1]. Cavities are created from such disruption and their non-linear expansion and collapse may result in very high pressures and temperatures locally, respectively up to 1,000 atm and 5,000 K [2], leading to the formation of radicals [3, 4]. In the case of water, its sonolysis may produce hydroxyl radicals and hydrogen atoms, that may either recombine to