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Monitoring acid-catalyzed hydrolysis of sucrose through low-resolution NMR relaxometry

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Reaction monitoring is usually achieved by high-resolution spectrometric and chromatographic techniques such as GC-MS, NMR and Raman Spectroscopy. These instruments are designed such that continuous monitoring of products and reactant in a reaction is not possible. Low-Resolution NMR systems provide easy designs to implement a continuous reaction system to the instrument. NMR is a non-invasive and non-destructive method that takes signal from whole sample and enables to evaluate signals from different compartments with varying proton environments. T2 NMR Relaxometry is based on measuring spin-spin relaxation signal (CPMG) and then decomposing the signal through a mathematical transformation known as Non Negative Least Square. In this study, NMR Relaxometry monitored acid hydrolysis of sucrose through T2-CPMG experiments. The acid hydrolysis experiments were designed to develop an accurate and quick repeatable method for the concentration determination of the hydrolysis product. Acid hydrolysis of sucrose was studied at different concentrations of sucrose (10%, 15% and 20% w/w). pH 2.5, HCl solution was used at 30ºC as the hydrolysis media. T2 relaxation times of the solutions were measured at pre-determined time intervals. Reducing sugar concentration was determined by the DNS (3, 5-dinitrosalicylic acid). 2 T2 peaks were detected based on NMR Relaxometry results. The T2 values of peaks showed significanthigh correlations ($p<0.05$) with the reducing sugar content. However, for different concentrations of sucrose different peaks of T2 gave better results.

Biography

Mecit Halil Oztop is a faculty member in the Department of Food Engineering at Middle East Technical University (METU), Ankara Turkey. His current research includes application of MRI/NMR relaxometry in food science and designing active packaging systems. He received his PhD degree from University of California, Davis Biological Systems Engineering on 2012 and started to work as faculty at METU right after.

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