Petrochemistry-2013

OMICS Group Conferences
Accelerating Scientific Discovery

World Congress on
Petrochemistry and Chemical Engineering

November 18-20, 2013 Hilton San Antonio Airport, USA

Offline and online applications of low-field NMR-spectroscopy

Gisela Guthausen
MVM & ITCP, Karlsruhe Institute of Technology, Germany

Abstract

Low-field NMR-spectroscopy (MR-NMR) is a re-discovered analytical tool for offline and online characterization of industrial processes. Especially in the case of fluidic reactions and substances, spectroscopy reveals non-destructively insight into composition and other physical parameters such as viscosity.
The advantage of MR-NMR, based on permanent magnets, is the robustness and the relatively small size of the equipment when compared with conventional high-field instrumentation. However, spectral resolution and sensitivity are limited due to physical reasons. Therefore, the applicability of MR-NMR in process analytics is investigated; some characteristics and their effect on applications have to be examined. Two examples of this approach and its challenges will be presented.
In a first example, pyrolysis oils, produced by the Karlsruhe Bioliq process from plant residues, were investigated. The water content of the pyrolysis oils is an important parameter in the subsequent entrained flow gasification. This parameter can be extracted from MR-NMR spectra and quantified via chemometric data processing.
The progress of liquid reactions is an important parameter for optimization of production. An optimized reaction process leads to lower consumption of energy and recourses. MR-NMR allows the online and real-time monitoring of reaction kinetics, which is shown by the example of an esterification reaction. The reaction was monitored online in a bypass, equipped with a self-designed NMR-probe, which allows the measurement of NMR-spectra at elevated temperatures and pressures.

Biography

Gisela Guthausen got her PhD from University Stuttgart, her postdoctoral studies were together with Prof. Blümich at RWTH Aachen. Subsequently she worked on MRI as well as on low-field NMR in Karlsruhe with respect to application in diverse engineering areas.