POLYMER ANALYSIS BY COMPACT NMR

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ABSTRACT

Typical NMR spectrometers use superconducting magnets, which are heavy, expensive and require high maintenance. This is one reason, why the reputation of NMR is perceived to be more demanding than that of many other analytical methods including IR spectroscopy and DSC. Yet NMR is also versatile. It provides spectra for chemical analysis, images that give insight into sample heterogeneity and function of devices, and relaxation parameters, which scale with mechanical material properties [1]. While superconducting magnets are common today in NMR, permanent magnets have been used decades before. They were temperature sensitive, hard to shim, heavy, and produce fields much lower than modern superconducting magnets. Yet in recent times, compact permanent magnets have been developed for NMR, which are light enough to be carried to the object or the production line for analysis [1]. As NMR relaxation can be measured in the inhomogeneous stray field, a portable stray-field NMR device known as the NMR-MOUSE has been developed for non-destructive materials testing [2,3]. It is particularly well suited for studying rubber materials and the morphology and semi-crystalline polymer products as a function of processing parameters and service time. Current research aims at predicting the residual service time of polymer pipes from such measurements [4]. In another project, the use of a desktop MRI magnet is investigated to acquire images of rubber gaskets within a few seconds, from which the position of the inner surfaces can be extracted for control the production process [5]. Last but not least, small magnets are employed to measure ^{1}H NMR spectra in real time under the fume hood to follow chemical reactions. These and other applications of compact, state-of-the art NMR magnets will be reported [6].Text of Abstract: Arial 10 (The total length of text including figures must not exceed one page).

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