

## **Automation of quantitative NMR spectroscopy of polyolefins in industry.**

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Quantitative NMR spectroscopy plays an indispensable role in polyolefin research from initial catalyst discovery/screening, through the product/process development phase and finally in securing intellectual property rights and production problem solving.

Due to the complex nature of the whole quantitative NMR process confidence in analytical results is only obtained through high repeatability and reproducibility. Although imperative for long term industry research and development unfortunately such aspects are often overlooked by academia. To address this issue Borealis has developed a modular system for quantitative spectral analysis which has enabled rapid, high quality setup, measurement, processing, analysis and reporting. The modular nature of these systems also facilitates rapid high-quality method development and allowed the systems to expand to address a wide variety of polyolefin systems. The general aspects, scope, limitations and future direction of this approach will also be presented.

As well as automated spectral analysis recent developments concerning hardware automation of the non-standard high-throughput melt-state MAS NMR technique will be presented. Full automation of sample exchange, setup, measurement, control and damage limitation of this technique have recently been achieved with extensive customisation and exceptional vendor support. This has allowed the full potential for this technique to be realised. The considerable technical and administrative challenges of automating such a non-standard analytical technique in industry will be presented.

Through the combination of a modular system for quantitative spectral analysis and reporting and melt-state MAS NMR hardware/setup automation Borealis can now offer high-quality microstructure analysis earlier and more widely to our research community. This has the potential to provide a step change in R&D opportunities for Borealis.