

Fast, accurate and affordable molecular analysis with NMR



Nuclear Magnetic Resonance (NMR) is helping Auburn University unlock the mysteries of polymeric materials. Assistant professor Bryan Beckingham explains how...

The importance of polymers

Polymeric materials can be found everywhere and are critical components in almost every industry and application from healthcare (including drug delivery, implant materials and anti-bacterial coatings) to energy systems (such as organic photovoltaics, fuel cells and batteries).

The Beckingham polymer lab carries out fundamental and applied research aimed at exploring the relationships between polymerization chemistry, polymer architecture, and the resulting material properties. Knowledge of such fundamental structure-property relationships is crucial to advancing the thoughtful design of polymeric materials for targeted applications.

We routinely synthesize unique small molecules to use as polymer building blocks and unique polymers for investigation. These small molecule precursors and synthesized polymers require precise molecular and macromolecular characterization for which NMR spectroscopy is a vital tool.

About Auburn University and its chemistry department

Auburn University is a Land, Space and Sea grant public R1 research university. The Chemical Engineering department has over 100 graduate students and 22 faculty members, together with 10 postdoctoral research associates and several visiting faculty members. The department enjoys state of the art facilities and is well supported by extramural research grants from numerous federal agencies and industrial companies; providing opportunities for world class research at every level. The department typically spends \$6 - 6.5 million per year on research and is one of the top 25 departments in terms of research expenditures per faculty member. Faculty and graduate students regularly publish in premier journals and participate in national and international conferences.

Introducing **Pulsar** benchtop NMR analysis

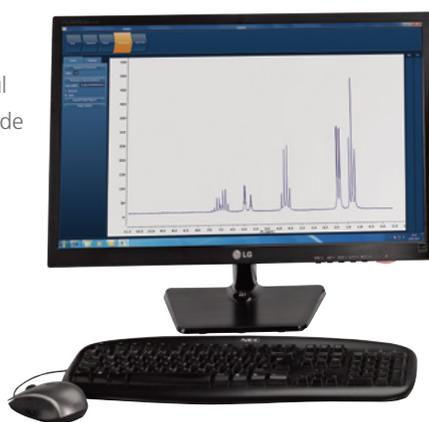
We purchased the Oxford Instruments **Pulsar** to facilitate fast, accurate analysis of these molecules and to perform kinetic tracking of polymerization and polymer modification reactions.

The **Pulsar** saves valuable time by allowing fast and accurate feedback on reaction conversion for many of the lab's syntheses. For several systems, **Pulsar** provides full macromolecular analysis without needing to obtain data from a higher field spectrometer. Prior to the **Pulsar**, this analysis would have been performed at a user facility located in the AU Chemistry department with an hourly user charge.

Easy analysis at your fingertips

Pulsar's key advantages are location, accuracy and ease of use. Having it in our lab provides the characterization information we need without having to schedule time and travel across campus to a user facility. By comparison, our local NMR facility is situated a 15-minute walk from our laboratory and with the large number of researchers and chemistry laboratories using the facility, obtaining much needed results as soon as possible can be challenging.

Having a **Pulsar** in our lab allows us to do our routine analysis immediately. For example, we need 100% conversion on several of our small molecule syntheses and the best method for validating this is NMR. Not having to wait for access lets us know immediately whether more time or additional reagent is needed for obtaining our desired products. The same is true for characterizing the polymers we are attempting to synthesize. **Pulsar** tells us whether we were successful or if the polymer needs to be remade without delay.



Pulsar is a high resolution, 60MHz benchtop NMR spectrometer, providing high quality 1-D and 2-D NMR spectra of ^1H , ^{19}F , ^{13}C and ^{31}P . It uses a permanent magnet which means that it requires neither liquid helium nor liquid nitrogen. Advanced, automatic shimming produces a highly homogeneous magnetic field, meaning that **Pulsar** is suitable for use in almost any academic or industrial chemistry laboratory.

Fast and user-friendly

Due to the speedy acquisition and good quality spectra we obtain, the **Pulsar** has become a preferred and much-used instrument. The ease of data acquisition has allowed undergraduates to be trained to use the **Pulsar** independently without supervision by graduate students that sometimes accompany the paid-for time at the user facility. The results for many of our systems are publication-worthy and have been presented at regional and national conferences. Recently, we published a manuscript in RSC Analyst validating the accuracy of our low-field spectrometer for several common polymer blends and block copolymers. This demonstrates the value provided by **Pulsar**.

Pulsar has been a valuable addition to our university lab, giving our students and researchers hands-on, practical experience of NMR.



If you would like to find out more or arrange a demo please get in touch today.

visit www.oxinst.com/pulsar for more information or email magres@oxinst.com



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