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Non-, or minimally invasive intact biological objects using slow magic angle spinning

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Metabolomics studies on tissues are of significance since a disease is often associated with a specific tissue or organ malfunction. It is, therefore, expected that the changes in metabolic profile are more dramatic in the diseased tissue than body fluids. It is likely that tissue specific metabolic profiling provides a unique window of investigating the biochemistry associated with a particular disease in greater detail than possible using global body fluids. In this work, we will report a non-destructive magic angle spinning NMR metabolomics technique that is capable of high resolution and high sensitivity metabolic profiling of biological samples, in particular tissue samples, with sample volume from as small as 200 nanoliters (nL) to as large as a milliliter or more using a single probe and using only a few minutes. This has been achieved by combining the techniques of high resolution slow-MAS 1H NMR technique and switchable inductively coupled static micro-RF coil-LC resonator and by rotating the specimen at a sample spinning rate of 40 to 200 Hz about the magic angle axis. The nanoliter capability has the potential to follow the metabolic changes through a continued investigation on a single small laboratory animal over a long period of time using minimally invasive blood and tissue biopsy samples; while the milliliter capability would allow minimally destructive studies of intact biological objects with size as large as $>1 \text{ cm}^3$. Examples of applications will be reported.

Biography

Jian Zhi Hu has completed his PhD at the age of 32 years from a Joint-Training Program between Wuhan Institute of Physics, the Chinese Academy of Sciences and the Department of Chemistry, University of Utah, USA, and Postdoctoral studies from University of Utah. He is a Senior Staff Scientist and Principal Investigator of the Pacific Northwest National Laboratory. He has published more than 160 papers in reputed journals. He received one US R&D 100 award and is a holder of 8 issued US patents.

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