東京大学グローバルCOEプログラム　機械システム・イノベーション国際拠点

東京大学 THE UNIVERSITY OF TOKYO

GMSI Global Center of Excellence for Mechanical Systems Innovation

第96回　GMSI公開セミナー

Nuclear Magnetic Resonance Imaging with Hyperpolarization

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日時：2012年3月7日（水）9：00−10:00
会場：東京大学工学部2号館 2F 221 講義室

Magnetic Resonance Imaging (MRI) is a powerful tool in medicine. This technique uses ^{1}H NMR signals of water and lipids for the reconstruction of images with excellent soft tissue contrast. However, in order to detect *in vivo* metabolic information, nuclear magnetic resonances from other nuclei, such as ^{31}P, ^{13}C etc. must be detected from substances having concentrations in the millimolar range or less. Here, the NMR signal is more than 100.000 less intensive compared to the ^{1}H signal.

One of the inherent drawbacks of NMR is its low sensitivity. This is caused by the low spin polarization of the order of 10^{-6}. Hyperpolarization is a technique which overcomes this low sensitivity and creates magnetic polarization of almost 1. Therefore, it enhances the NMR signal by a factor of 100.000 or more. Hyperpolarization can be performed using optical techniques or using the interaction of electron and nuclear spins in an experiment called “dynamic nuclear polarization” (DNP). We have used DNP to hyperpolarize ^{13}C-labelled substances and to observe the metabolism of different organs in vivo.
The lecture will present the theory and the technology for hyperpolarization of substances which can be applied for in vivo studies. We will also show applications to the study of the metabolism of tumors in animal models. These experiments were performed in cooperation of several institutes of the TU München and the GE Global Research Institute in Germany.

主催：　東京大学グローバルCOEプログラム「機械システム・イノベーション国際拠点」
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