

日本物理学会北陸支部特別講演会

日時：2018年3月8日（木）13:30~15:00

場所：金沢大学自然科学研究科5号館504号室

講師：Prof. Murat Tagirov (Quantum Electronics and Radiospectroscopy
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講演題目： ^3He NMR in Nanostructures at low temperatures

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Abstract

The study of the spin kinetics of ^3He in contact with aerogels and nanodiamonds by the pulsed nuclear magnetic resonance (NMR) methods will be presented. Nanodiamonds. In recent years nanodiamonds have become a widely investigated material for quantum engineering, biological and electronic applications. The spin-lattice (T_1) and spin-spin (T_2) relaxation times of ^3He were measured in adsorbed, gas and liquid phases in a detonation nanodiamond sample at the frequency range of 5–18 MHz and at $T = 1.6$ K temperature. The observed T_1 and T_2 are much shorter in comparison with ^3He in similar experiments for samples with restricted geometry, thus we assume a strong impact of paramagnetic centers on nuclear magnetic relaxation. Experiments with nanodiamond surface preplated with N_2 or ^4He layers will be presented. The model of ^3He relaxation in contact with detonation nanodiamonds that describes our experimental results will be proposed. Earlier, we systematically studied the nuclear magnetic relaxation of ^3He in contact with silicate aerogels. The determining role of the adsorbed layer in relaxation processes of gaseous and liquid ^3He was confirmed. It is known that aerogel acts as an impurity and affects phases of superfluid ^3He . Nowadays, it is of interest to study superfluid ^3He in contact with anisotropic aerogels. An additional mechanism of the ^3He relaxation in aerogels is found and it is shown that this relaxation mechanism is not associated with the adsorbed layer. A hypothesis about the influence of intrinsic paramagnetic centers on the relaxation of gaseous ^3He is proposed.