

NMR of the topological insulator Bi_2Te_3 single crystal

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Nowadays such materials as topological insulators are of a great interest. Their existence was predicted theoretically and then discovered experimentally only recently [1]. It was shown that the semiconductors Bi_2Te_3 have the properties of 3D topological insulators. Despite the large numbers of experimental works on this material there are only few papers [2-4] on the NMR measurements of Bi_2Te_3 . There are no measurements in details in the wide temperature range of this single crystal material.

We have carried out NMR studies of the high-quality topological insulator Bi_2Te_3 single crystal plates in two orientations and powder. The single crystal plates were studied in two orientations: when the crystallographic axis c was parallel and perpendicular to the external magnetic field B_0 . Experimental data were obtained for ^{125}Te within the temperature range from 12.5 to 293 K at magnetic field 9.4 T using a Bruker Avance 400 pulse spectrometer at the Center for Diagnostics of Functional Materials for Medicine, Pharmacology and Nanoelectronics of Research park of St. Petersburg State University.

It has been found that the ^{125}Te NMR spectra at different temperatures consisted of broad lines with two clear maxima with positive and negative shifts for the single crystal plate when the c axis was perpendicular to the external magnetic field B_0 and for powder. A completely different situation was observed for the other orientation when the axis c was parallel to the external magnetic field B_0 . The ^{125}Te NMR spectrum at the room temperature consisted from the clear maximum in the high-frequency range and from the low-intensity shoulder on the left side of the maximum. For this orientation there was no line in a low-frequency range. We observed extremely different behaviour of NMR line shifts with decreasing temperature for different orientations of plates and powder.

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