Instruments and Experimental Techniques

Volume 69, Issue no.1/ 2026. ISSN 0020-4412

Method for studying uniaxial deformed wires in a perpendicular magnetic field

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https://doi.org/10.1134/S0020441226700016

Abstract

An experimental cell design for studying the properties of anisotropic materials under the action of a magnetic field during deformation is described. The developed method has been tested by studying the properties of low-dimensional samples of anisotropic materials subjected to deformation. Single glass-coated bismuth wires as more suitable objects characterized by a large elastic strain range were selected for these studies. Dependencies of the resistance of bismuth wires on deformation in a transverse magnetic field have been measured by modifying the design of the bronze console of the insert, in which the wire is fixed. The proposed method has been used to reconstruct the Fermi surface topology in single glass-coated bismuth wires under uniaxial deformation by studying quantum oscillations of the perpendicular magnetoresistance for different orientations of the magnetic field relative to the crystallographic axes.

Keywords: *studying uniaxial, deformed wires, magnetic field*

References:

1. Bukharaev, A.A., Zvezdin, A.K., Pyatakov, A.P., and Fetisov, Yu.K., *Phys.-Usp.*, 2018, vol. 61, no. 12, pp. 1175–1212. https://doi.org/10.3367/ufne.2018.01.038279
   Article Google Scholar
2. Brandt, N.B., Kulbachinskii, V.A., and Minina, N.Y., *JETP Lett.*, 1977, vol. 26, pp. 162–165.
   ADS Google Scholar
3. Wu, C.Y., Han, J.C., Sun, L., Gong, H.R., and Liang, C.P., *J. Phys.: Condens. Matter*, 2018, vol. 30, no. 28, p. 285504. https://doi.org/10.1088/1361-648x/aacab9
4. Inamoto, T. and Takashiri, M.M., *J. Appl. Phys.*, 2016, vol. 120, no. 12, p. 125105. https://doi.org/10.1063/1.4963875
5. Suslov, A.V., Gerega, V.A., Grabov, V.M., Demidov, E.V., and Komarov, V.A., *Fiz.*

Tekh. Poluprovodn. (St.-Petersburg), 2022, vol. 56, pp. 178–181. https://doi.org/10.21883/FTP.2022.02.51958.31
Book Google Scholar

6. Gaidukov, Yu.P., *Sov. Phys. Usp.*, 1984, vol. 27, no. 4, pp. 256–272. https://doi.org/10.1070/pu1984v027n04abeh004042
Article ADS Google Scholar

7. Gaidukov, Yu.P., Danilova, N.P., and Shcherbina-Samoilova, M.B., *Prib. Tekh. Exp.*, 1979, vol. 1, p. 250.
Google Scholar

8. Condrea, E., Gilewski, A., and Nicorici, A., *J. Phys.: Condens. Matter*, 2013, vol. 25, no. 20, p. 205303.
https://doi.org/10.1088/0953-8984/25/20/205303

9. Condrea, E., Gilewski, A., and Nicorici, A., *Phys. Lett. A*, 2016, vol. 380, nos. 11–12, pp. 1210–1216. https://doi.org/10.1016/j.physleta.2016.01.009
Article ADS Google Scholar

10. Hagiwara, M. and Inoue, A., in *Rapidly Solidified Alloys*, Liebermann, H.H., Ed., New York: Dekker, 1993, p. 139.
Google Scholar

11. Lin, Y.-M., Rabin, O., Cronin, S.B., Ying, J.Y., and Dresselhaus, M.S., *Appl. Phys. Lett.*, 2002, vol. 81, no. 13, pp. 2403–2405. https://doi.org/10.1063/1.1503873
Article ADS Google Scholar

12. Heremans, J. and Thrush, C.M., *Phys. Rev. B*, 1999, vol. 59, no. 19, pp. 12579–12583. https://doi.org/10.1103/physrevb.59.12579
Article ADS Google Scholar

13. Brandt, N.B., Gitsu, D.V., Dolma, V.A., and Ponomarev, Ya.G., *Sov. Phys. JETP*, 1987, vol. 65, p. 515.
ADS Google Scholar

14. Edel’man, V.S., *Sov. Phys. Usp.*, 1977, vol. 20, no. 10, pp. 819–835. https://doi.org/10.1070/pu1977v020n10abeh005467
Article ADS Google Scholar

15. Murata, M., Yamamoto, A., Hasegawa, Ya., Komine, T., and Endo, A., *J. Appl. Phys.*, 2021, vol. 121, no. 1, p. 014303. https://doi.org/10.1063/1.4973191

16. Yang, F.Y., Liu, K., Hong, K., Reich, D.H., Searson, P.C., Chien, C.L., Leprince-Wang, Y., Yu-Zhang, K., and Han, K., *Phys. Rev. B*, 2000, vol. 61, no. 10, pp. 6631–6636. https://doi.org/10.1103/physrevb.61.6631
Article ADS Google Scholar