MAGNETIZATION LOOPS OF THE SUPERCONDUCTING FOAM BASED ON $Bi_{1.8}Pb_{0.3}Sr_{1.9}Ca_2Cu_3O_X$

D.M. GOKHFELD[1], K.A. SHAYKHUTDINOV[1], M.I. PETROV[1], D.A. BALAEV[1], , S.I. POPKOV[1,2], S.A. SATZUK[1]

Superconductors in foam form are novel class of materials. They have specific properties attractive for applications in many areas. We presents the results of comparison of experimental magnetization vs. magnetic field dependences M(H) with theoretical one. Superconductor $Bi_{1.8}Pb_{0.3}Sr_{1.9}Ca_2Cu_3O_x$ with micro-foam structure and bench mark polycrystalline $Bi_{1.8}Pb_{0.3}Sr_{1.9}Ca_2Cu_3O_x$ are experimental objects. Materials have densities 0.38 and 0.95 of theoretical one for Bi-2223 respectively. The shape of M(H) dependencies is the same for porous and high density HTSCs, but the absolute value of diamagnetic response is higher in 1.63 times in case of porous superconducting material. Bean model [1] is usually used for description of M(H) and determination of the critical current value. However in our case it is important to account the granular structure of superconductors. Valkov - Khrustalev theory [2] gives satisfactory results for description of experimental dependencies of M(H) obtained at 4.2 K. In higher temperatures the agreement of the theory and experimental data becomes worse. Unfortunately this theory does not consider the fractal structure of porous superconductor [3]. The fractal dimension of media would be estimated from the analysis of experimental CVCs [4].

This work is supported by program of President of Russian Federation for support of young scientists, grant MK 1682.2004.2., and by Krasnoyarsk Regional Scientific Foundation (KRSF), grant 12F0033C.

References

[1] C.P. Bean. Rev. Mod. Phys. 36, 31 (1964).
[2] V.V. Valkov, B.P. Khrustalev. JETF 80, 680 (1995) [Zh. Eksp. Teor. Fiz. 107, 1221 (1995)].
[3] M. Prester. Phys. Rev. B 60, 3100 (1999).
[4] Yu.I. Kuzmin. J. Low Temp. Ph. 130, 261 (2003).

[1]L.V. Kirensky Institute of Physics SB RAS, 660036, Krasnoyarsk, Russia, [2]M.F. Reshetnev Siberian State Aerospace University, 660014, Krasnoyarsk, Russia, E-mail: smp@iph.krasn.ru