MAGNETIC RELAXATION BEHAVIOR AND IRREVERSIBILITY LINE IN BULK BI-BASED HTSC WITH MICRO-FOAM STRUCTURE

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

Irreversibility line of type-II superconductors separates two different regions on the phase $H-T$ diagram of HTSC's [1], above which the magnetization becomes reversible and critical current density vanishes. The irreversibility field H is a very important characteristic of pinning force strength and, therefore, one of the main parameters influenced on some physical properties of type-II superconductors, for example, levitation.

This contribution is devoted to preliminary study of irreversibility field of novel bulk HTSC $Bi_{1.8}Pb_{0.3}Sr_{1.9}Ca_2Cu_3O_x$ with low density (0.38 from theoretical one for bulk Bi-based ceramic) and micro-foam structure. Also we present the results of magnetic relaxation measurements. This novel materials have pinning force and levitation properties compared to that for bulk $YBa_2Cu_3O_7$ materials [2], which makes such materials attractive for practical application.

The dependence of irreversibility line $H(T)$ of $Bi_{1.8}Pb_{0.3}Sr_{1.9}Ca_2Cu_3O_x$ have been derived from DC magnetization measurements. The $H(T)$ dependence is fitted well by thermally activated flux motion [1] in high field region ($H = H_0 exp(-T/T_c)$) [3]. In low field and high temperature region the dependence is follows by $\sqrt{H} = C(1/kT - 1/kT_c)$ which is characteristic of plastic motion of pinned flux liquid [4]. The crossover takes place at $H \approx 10$ kOe. The activation energy U have been derived from magnetic relaxation measurements performed in applied magnetic field $H = 2.2$ kOe. $U_0 = 24.5$ meV for bulk $Bi_{1.8}Pb_{0.3}Sr_{1.9}Ca_2Cu_3O_x$ with low density and $U_0 = 30.2$ meV for bulk $Bi_{1.8}Pb_{0.3}Sr_{1.9}Ca_2Cu_3O_x$ prepared by standard ceramic technology from grinded foam.

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[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