FLUX CREEP AND CURRENT-VOLTAGE DEPENDENCIES OF $Pb_2Sr_2Re_{1-n}Ca_xCu_3O_{8+y}$ (Re = Y, Dy) SINGLE CRYSTALS

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The critical current densities j_c of $Pb_2Sr_2Re_{1-x}Ca_xCu_3O_{8+y}$ (Re = Y, Dy) single crystals were determined from the magnetization curves $P_m^{ZFC}(B)$ at different temperatures on the basis of anisotropic Bean model. It is found that temperature dependencies of j_c follow to the equation: $j_c(0,T) = j_c(0,0)\exp(-T/T_0)$ for both orientations. For zero field the critical current anisotropy of j_c $K = j_c^{\perp c}/j_c^{\parallel c}$ slightly decreases with temperature growth from 6.2 for 4.2 K to 4.2 for 50 K. The K value is found to be independent of B. The relaxation of magnetic moment P_m follows quite well to the logarithmic law in time interval from 100 s to 4000 s for both orientations. In difference with the ordinary behaviour magnetic field dependence of relaxation rate $R = dP_m/d(\ln t)$ for $B \parallel c$ has two transition points. The first corresponds to the known topological transition in shielding current penetration. The second is found to be produced by the change of pinning mechanism at high magnetic fields. With T increasing the first mechanism vanishes. For the orientation $B \perp c$ ordinary $R(B)$ behaviour corresponding to only one pinning mechanism is observed. It's found that in case the activation energy U_0 is proportional to B^{-1}. The U_0 anisotropy: $U_0(B \parallel c)/U_0(B \perp c) \approx 1$ is much lower than observed j_c anisotropy. Using the magnetic moment relaxation the current-voltage characteristics are extracted with $E \sim dP_m/dt$ and $j_c \sim P_m$. Their transformation under the magnetic field and temperature influence are analyzed.

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