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Thermoremanent Magnetization in $Er_{1-x}Tm_xFe_2O_4$

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Rare-earth iron oxides of the form RFe_2O_4 (R=Y, Er, Tm, Yb and Lu) have a rhombohedral structure with the space group R3m [1]. It is composed of the alternate stacking of the hexagonal $Fe_2O_{2.5}$ layer (W-layer) and the hexagonal $RO_{1.5}$ layer (U-layer) along the c-axis. Strong magnetic interactions between the localized Fe moments give rise to magnetic ordering below 250 K [2-5]. The thermoremanent magnetization (TRM) is observed in R=Tm, Yb and Lu [4, 5]. In order to understand origin of TRM, we have studied the magnetic properties of Tm substituted $ErFe_2O_4$. We prepared stoichiometric polycrystalline samples by solid-state reaction. Figure 1 shows the temperature dependence of field-cooled (FC) and zero-field-cooled (ZFC) magnetization for $ErFe_2O_4$ and $Er_{0.9}Tm_{0.1}Fe_2O_4$ with an applied magnetic field of 100 Oe. The field-cooling effect is observed in $Er_{0.9}Tm_{0.1}Fe_2O_4$, but not in $ErFe_2O_4$.

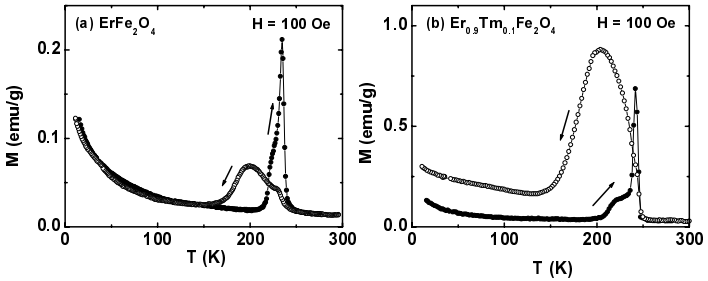

Fig. 1. Temperature dependence of magnetization for $ErFe_2O_4$ and $Er_{0.9}Tm_{0.1}Fe_2O_4$.

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BR08

Influence of Heat Treatment on the Superconductivities of MgB_2 Bulk Sintered in Different Processing Atmosphere

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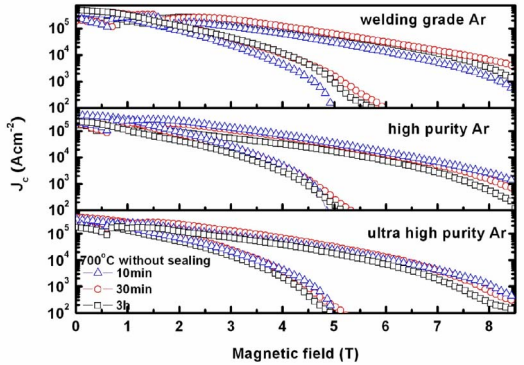
The effect of processing atmosphere and heat treatment on critical current density, J_c, was studied for MgB_2 bulk samples made using the in situ technique under argon atmosphere with three different purities, ultra-high, high, and welding grade. The critical temperature, T_c, and the amount of MgO show little variation for the samples treated under the three different argon atmospheres. The J_c for the sample processed under the welding grade argon has much weaker field dependence in high field region than that for the samples treated in ultra-high and high purity argon. Scanning electron microscope (FEG-SEM) examination revealed that the sample processed in welding grade argon possessed small grains, and XRD refinement analysis revealed larger crystalline strains, to all of which the improvement in high field J_c of this sample can be attributed, because they are believed to act as effective pinning centres. These results verify the dual reaction model where the MgB_2 formation and the reaction between oxygen and precursor take place simultaneously, resulting in an optimal doping effect.



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