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COMPARATIVE STUDY OF FLUX PINNING, FLUX CREEP AND CRITICAL CURRENTS BETWEEN YBaCuO CRYSTALS WITH AND WITHOUT Y_2BaCuO_5 INCLUSIONS

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In the Y-Ba-Cu-O system $YBa_2Cu_3O_x$ phase is produced by the following peritectic reaction: Y_2BaCuO_5 + liquid → $2YBa_2Cu_3O_x$. Through the control of processing conditions and starting compositions it becomes possible to fabricate large crystals containing fine Y_2BaCuO_5(211) inclusions. Such crystals exhibit Jc values exceeding 10000 A/cm^2 at 77K and 1T.

Recently, we have developed a novel process which can control the volume fraction of 211 inclusions. Elimination of 211 inclusions is also possible. In this study, we prepared YBaCuO crystals with and without 211 inclusions using the novel process and compared flux pinning, flux creep and critical currents. Figure 1 shows magnetic field dependence of Jc for YBaCuO crystals with and without 211 inclusions. It is clear that fine 211 inclusions can contribute to flux pinning. It was also found that flux creep rate could be reduced by increasing flux pinning force. Critical current densities estimated based on the conventional flux pinning theory were in good agreement with experimental results.

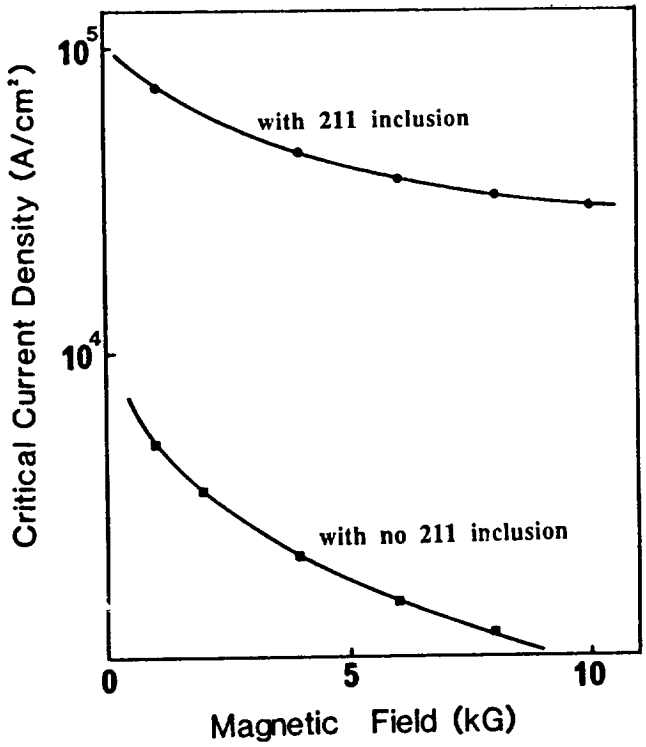

Fig. 1. Magnetic field dependence of YBaCuO crystals with and without 211 inclusions at 77K.