Quench Characteristics of YBCO Film for Current Limiting using Magnetic Field

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One of the first feasible applications of high temperature superconductors seems to be fault current limiters(FCL) in power distribution networks. A number of different types of FCL have been proposed so far. we have studied YBCO films for current limiting of the resistive type which utilizes a transition from superconducting to normal state caused by exceeding critical current. The films were deposited on sapphire substrates and covered by gold top layer. The current limiting element consists of 2 mm wide YBCO stripes connected in series. A serious problem in using YBCO films for current limiting is inhomogeneities caused by imperfect manufacturing. Therefore simultaneous quenches are a difficult problem when elements for current limiting are connected in series. So some researchers have recently proposed using magnetic field and heating for simultaneous quench. We have measured extended electric field-current density(E-J) characteristics for current limiting elements of YBCO films in applied magnetic field of 0 - 130 mT. And we have investigated quench characteristics in current limiting elements and between elements of YBCO films in applied magnetic field. The result of the experiments show that the presence of applied magnetic fields induces uniform quench distribution for the stripes in element at 50 V_{rms}, otherwise non-uniform quenches were observed. And simultaneous quenches between elements were investigated at 150 V_{rms}. We suggest that suppressing the critical current by increased fields due to fault current effectively forced the stripes of higher Jc(0) to quench, resulting in equalizing quench times.

keywords : Fault current limiter, quench characteristic, magnetic field