

Contact Resistance Characteristics of High Temperature Superconducting Bulk

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Abstract— A Persistent Current Switch (PCS) is a key component for Superconducting Magnetic Energy Storage (SMES) system because it is used to change a superconducting coil from storage mode to transfer mode. In the previous paper, $\text{YBa}_2\text{Cu}_3\text{O}_{6+\delta}$ (YBCO) bulk of High-temperature superconductor (HTS) was proposed as a switch material, and the test on the fundamental characteristics of a mechanical contact between two YBCO bulks was carried out. As a result, a switching phenomenon between low and high resistance ranges is observed at a threshold current value in V-I characteristics of the YBCO contact. The threshold current is called a transfer current. In this paper, the relation between surface treatment and transfer current is investigated and the transfer current is found to be larger in finely finished surface. And instability of contact voltage is observed in the low resistance range. Further, a numerical analysis of the current and temperature distributions is tried to clarify the transition between high and low contact resistance ranges.

Index Terms—Contact resistance, Transfer current, High-temperature superconductor, YBCO