c-axis Characterization of Intrinsic Josephson Junctions in Submicron Area Fabricated of a High T_c Superconductor $Bi_2Sr_2Ca_2Cu_3O_{10+\delta}$

S. Saini [a] and S.-J. Kim [b]

[a] *Graduate School of Science and Technology.*

[b] *Department of Mechanical System Engineering and Research Institute of Advanced Technology, Faculty of Engineering, Jeju National University, Korea.*

Whiskers can be used in the fabrication of new electronic devices with application of intrinsic Josephson junction effects and related phenomenon. Growth and characterization of high temperature superconducting single crystal whiskers have always been focused by researchers to study in small cross section (when width and thickness are less than the magnetic penetration depth). To study the detailed characteristics of nano-periodic Josephson junction array (JJA) in a $Bi_2Sr_2Ca_2Cu_3O_{10+\delta}$ (Bi-2223) single crystal whiskers without shunted grain boundaries, we fabricate JJA in a Bi-2223 single crystal whisker using focused ion beam (FIB) etching technique. We etched single crystal whisker in *ab*-plane with size of 0.5 µm x 0.5 µm and height (*c*-axis) of about 150 nm. All elementary junctions have arranged in the series as an array. We performed resistance - temperature (*R-T*) characteristics and found critical temperature (T_c) about 108 K. We found a well defined voltage gap of about 2V and critical current density of about 25 A/cm^2 in current – voltage (*I-V*) characteristics. In future we will discuss fabrication and electrical properties of a submicron sized JJA in Bi-2223 single crystal whiskers.

Keywords: Bi-2223, Focused ion beam, Josephson junction, Single crystal whisker, Superconducting gap