Observation of Supercurrent through Topological Insulator Nanowires of Bi_2Se_3

Hyunho Noh[a], Lee-Seul Park[b], Eun-Kyoung Jeon[c], Jeong-O Lee[c], Jin Seok Lee[b], Jinhee Kim[a], and **Yong-Joo Doh**[d]

[a]Korea Research Institute of Standards and Science, Korea
[b]Department of Chemistry, Sookmyung Women's University, Korea
[c]NanoBio Fusion Research Center, Korea Research Institute of Chemical Technology, Korea
[d]Department of Display and Semiconductor Physics, Korea University Sejong Campus, Korea

Topological insulators are exotic materials with bulk band gap and metallic edge states which are protected on their own boundary topologically. Here, we report on the fabrication and measurement results of the superconducting proximity junctions of topological insulator nanowires of Bi_2Se_3. Single-crystalline Bi_2Se_3 nanowires are synthesized using the vapor-liquid-solid method, while the superconducting Al electrodes are formed on top of the nanowire. When a magnetic field (H) is applied along the nanowire axis, the magneto-resistance data exhibit quasi-periodic oscillations with a periodicity of $H^* \sim 1$ T. Increasing temperature or bias suppresses the oscillations to be vanished, which infers that the oscillations are due to the phase coherent electrical transport. In the superconducting state, the supercurrent branch with a critical current of $I_c \sim 100$ nA is clearly observed in the current-voltage curve. Irradiated with the microwave, the Bi_2Se_3 nanowire Josephson junction exhibits quantized voltage steps satisfying ac Josephson relation.