Fabrication of Mo-Cu Bilayers as Transition-edge Sensors

S. H. Song[*, a], Y. H. Lee[a], S. K. Lee[a], H. Kwon[a],
J. M. Kim[a], C. M. Lim[a], H. M. So[b], J. J. Kim[b]

[a] *Biomagnetism Research Center, Korea Research Institute of Standards and Science*

[b] *Department of Physics, Chonbuk National University*

We are developing X-ray microcalorimeters using superconducting transition-edge sensors (TES), which can be used for high-energy-resolution photon detectors. The TES is formed by proximity-effect bilayer of Mo and Cu. Fabrication begins with the deposition of low-stress Si_3N_4 films of 0.3 μm thick on both sides of double-sided polished <100> silicon wafers. Mo-Cu bilayers were deposited by dc sputtering system at a base pressure of 1×10^{-5} Pa and working Ar pressure of 1 Pa. A wiring layer of 200 nm thick Mo is deposited on the front side. The bilayer is deposited by sputtering the Mo layer and then the Cu layer. We then pattern both the Cu and Mo layers by wet etching. After fabrication of the TES, the interface between the bilayer and the bank is cleaned prior to the deposition by RF sputter cleaning with Ar gas. Depending on the Cu bank along the bilayer edge, the resistance-temperature curves showed different feature. To reduce the heat capacity of the microcalorimeter, the TES was isolated thermally from the Si substrate by anisotropic wet etching of the Si wafer, leaving the detector supported by a thin Si_3N_4 membrane.

keywords : Superconducting detector, Mo-Cu bilayer, Transition-edge sensor, Si membrane structure