Probing Electrical S/N Boundary in a Superconductor-normal Metal-superconductor Sandwich

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We report preliminary result with a simple model on the temperature dependence of the resistance in a thick-barrier superconductor-normal metal-superconductor (SNS) sandwich junction. We investigate an SNS sandwich of Nb-$MoSi_2$-Nb with a very thick metallic $MoSi_2$ barrier, which is thick enough so that virtually no Josephson supercurrent is observed. $MoSi_2$ is known to have small interface resistance and rigid S/N boundary with Nb, and superconducting transition was not observed down to 100 mK. The junction resistance decreases monotonically when the temperature is lowered, while the resistivity of the barrier itself increases slightly at the same time. This is due to the proximity induced order parameter in the normal barrier, where zero resistance (super-conductivity) occurs in the region with non-zero induced order parameter. This indirectly implies that the normal metal itself has non-zero interaction potential; hence it would have a finite superconducting T_c at some lower temperature. By setting up an appropriate theory, we expect that we can extract information on the boundary at which Andreev reflection occurs, and that we can infer even extremely low superconducting transition T_c in the normal metal that is related to the intrinsic material parameters.

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