Promising submicron Nb and Al based Josephson junction for superconducting circuits

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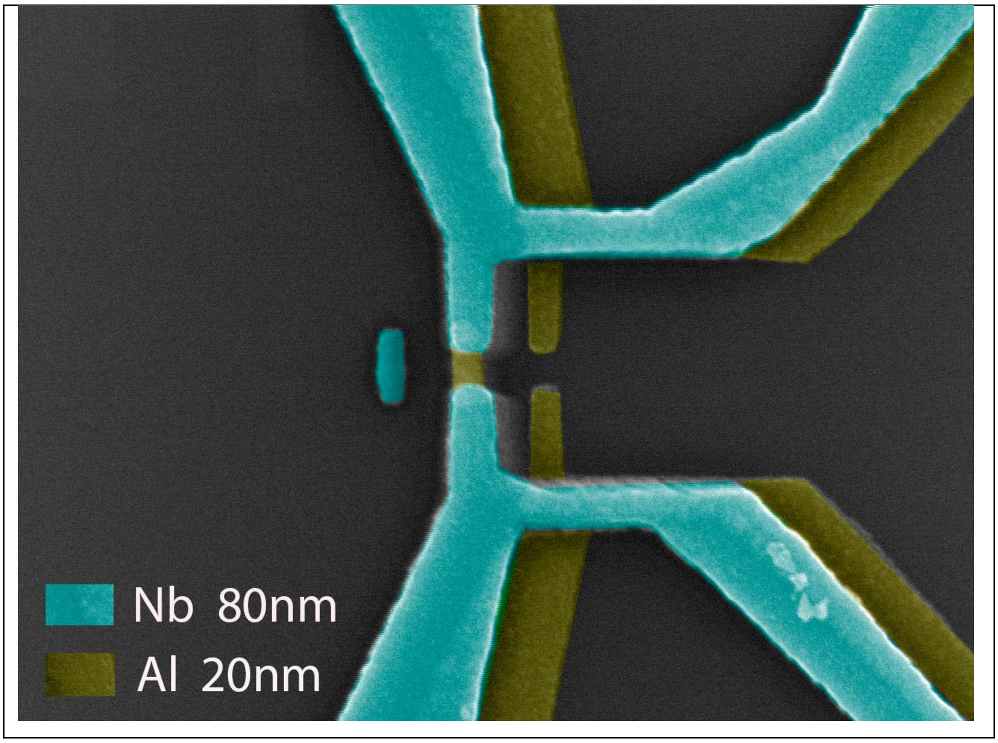
In this report, we present results of fabrication and characterization of submicron planar Nb/Al Josephson junctions with an active area of 5×10^4 nm^2. The study demonstrates that the use of aluminum as a weak link material significantly enhances the critical current across the entire temperature range due to the proximity effect. At a temperature of 4.2 K, the junction exhibits non-hysteretic current-voltage characteristics, making it a promising candidate for superconducting digital electronics. The device shows characteristic voltages up to 7 mV and critical currents around 50 μA.



Pic.1 SEM image of one of studied junctions. Al layer painted as green, Nb layer painted as blue.