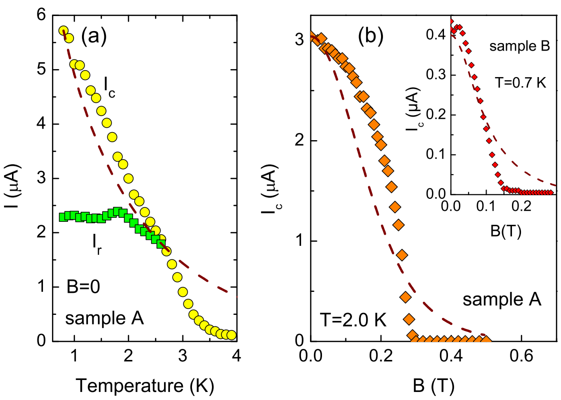

FIG. 3: (Color online) (a) I_c (○) and I_r (□) vs. T of sample A. The dashed line represents the calculated values following Ref. [16]. (b) I_c as a function of B of sample A. The dashed line corresponds to the calculated $I_c(B)$ dependence following Ref. [16]. The inset shows the corresponding values for sample B.

supercurrent is completely suppressed. In contrast to wide S/semiconductor/S Josephson junctions,[27] no Fraunhofer-type interference pattern of $I_c(B)$ is observed. The absence of a magnetic interference pattern in SNS structures was first observed by Anger *et al.*[28] and theoretically explained by Hammer *et al.*[16] and Cuevas and Bergeret.[17] The reason for the monotonous decay of I_c is that for junctions with a width smaller than the magnetic length ξ_B the magnetic field acts as a pair-breaking factor. Indeed at the field of 0.16 T where the first minimum at Φ_0 is expected in the Fraunhofer interference pattern the magnetic length ξ_B is as large as 110 nm and thus comparable to the junction width. For sample B a similar dependence of I_c on B is observed with a full suppression of I_c at 0.2 T. By using the model of Hammer *et al.*[16] for the the case of low transparent junctions we calculated the expected dependence of I_c on B for $E^*_{Th} = 0.15$ meV. As can be seen in Fig. 3(b), a reasonable agreement between experiment and theory is obtained. The same is true for sample B with $E^*_{Th} = 0.7$ meV [cf. Fig. 3(b), inset]. A possible reason for the discrepancy between the experimental values and theoretical curves might be that in our InN nanowires the current flows mainly in the surface accumulation layer, which leads to an inhomogeneous current distribution.

In summary, superconducting Nb/InN-nanowire/Nb junctions with large critical currents up to 5.7 μA and large I_cR_N products up to 0.44 mV have been fabricated. Owing to the small width of nanowires a monotonous decrease of I_c with B was observed, since in this case the magnetic field is the main pair breaking factor. The present results suggest that Nb/InN-nanowire/Nb structures are well suited for fundamental research and application in nano-scaled Josephson junction-based devices.

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