In situ tailoring of superconducting junctions *via* electro-annealing

Supplementary Materials

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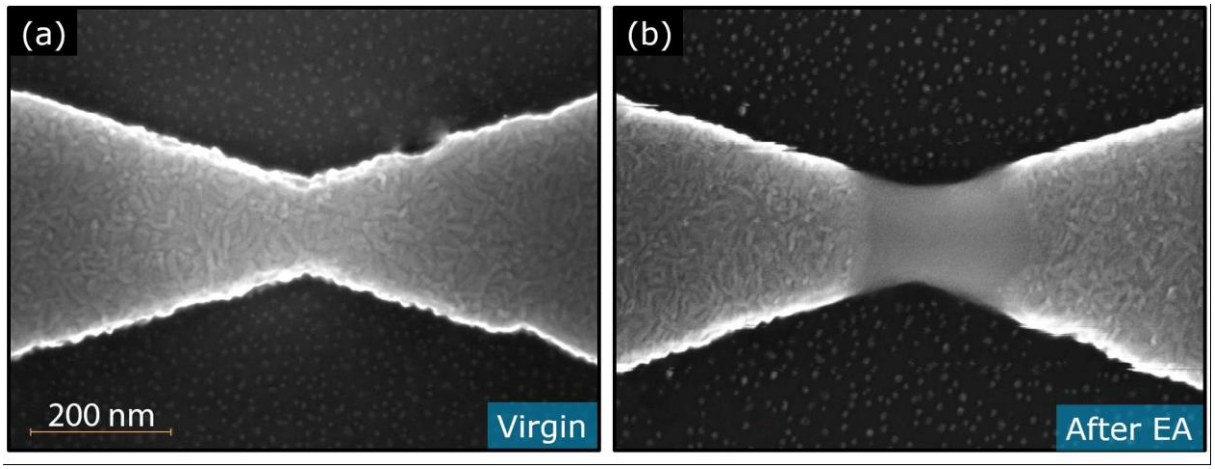

Figure S1 : **Details of amorphization by electro-annealing.** (a) High-resolution SEM image of the constriction in the virgin state. (b) Constriction after several electro-annealing processes. One notices a structural change in the constriction: the initially granular structure underwent amorphization**.**

Figure S1 shows high resolution scanning electron microscopy images of a Nb nanoconstriction before (Fig. S1(a)) and after several electro-annealing processes (Fig. S1(b)). In Fig. S1(a), the polycrystalline structure of the virgin Nb nanoconstrictions is clearly visible. Under electro-annealing, this polycrystalline structure vanishes locally and leaves place for an amorphized central area responsible for the formation of a weak link.

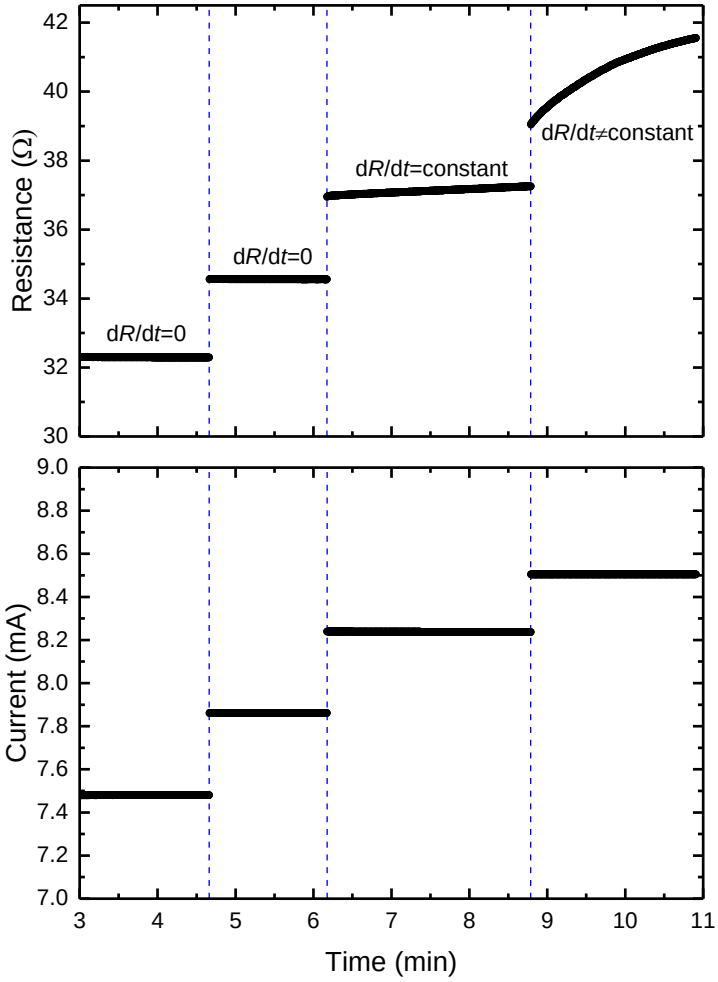

Figure S2 : **Time dependence of electro-annealing process.** Resistance as a function of time (upper panel) for the corresponding current (lower panel). The measurements have been performed at 10 K.

Figure S2 shows the time dependence of the electro-annealing process. The lower panel shows steps of constant current. The upper panel shows that even if the current remains constant, the electro-annealing process evolves in time for currents above certain threshold current. This points out to the importance of properly defining the electro-annealing current.