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Complete stabilization and improvement of the characteristics of tunnel junctions by thermal annealing ILARI MAASILTA, PANU KOPPINEN, LASSE VAISTO, University of Jyvaskyla, Finland — We have observed that submicron sized Al–AlO_x–Al tunnel junctions can be stabilized completely by annealing them in vacuum at temperatures between 350°C and 450°C. In addition, low temperature characterization of the samples after the annealing show a marked improvement of the tunneling characteristics, by disappearance of unwanted resonances in the current. Charging energy, tunneling resistance, barrier thickness and height all increase after the treatment. The superconducting gap is not affected, but supercurrent is reduced in accordance with the increase of the tunneling resistance. A useful application of the annealing is in increasing the sensitivity of Josephson junction threshold current detectors, currently used for example in superconducting quantum bit readouts. It is also expected that all other barrier dependent characteristics will also improve (e.g. critical current noise).

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