Magnesium diboride nanobridges fabricated by electron-beam lithography

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Abstract(s)

MgB2MgB2 nanobridges were fabricated by e-beam lithography and Ar-ion beam milling. Nanobridges of widths ranging from 60 nm to 1μm1μm and 3μm3μm in length were realized by Ar-ion beam milling using amorphous carbon as etching mask. The processing did not harm the superconductingproperties appreciably. High values of the critical current density, more than 10MA/cm210MA⁄cm2, were measured for bridges with widths down to 60 nm. Current-voltage (I-V)(I-V)characteristics showed a behavior typical of a bridge going normal, after the critical current is exceeded, and remaining normal as the current is decreased to a lower switch back value due to Joule heating. We could also observe switching behavior in some bridges indicating formation of normal hotspots in the bridges before they returned to their superconducting state. Alternative explanations may include natural grain boundaries in the film or the movement of Abrikosov vortices. The current-voltage (I-V)(I-V)characteristics showing critical current densities up to 5×107A/cm25×107⊠A⁄cm2 indicates excellent filmproperties in the nanobridges.