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Long Time Thermal Stability and Radiation Resistance of Nanostructured Microcomposite Wires Based on Cu-Nb Alloy

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The long time thermal stability and radiation resistance of micro composite wires based on Cu-Nb alloy intended for use in devices with high neutron fluxes has been studied. We have demonstrated that for a given niobium content in the alloy (6%), it is possible to keep the ultimate tensile strength higher than 375 MPa after exposed to annealing vacuum treatment at 450 ℃ up to 3000 hours.

The highly developed interface of FCC(111) and BCC(110) phases in strongly deformed Cu / Nb wires ensures its radiation resistance under irradiation conditions in the range from 1017 to 1020 n/cm2, which is experimentally revealed due to the invariability of the specific electrical resistance of the irradiated samples.

SEM studies of the morphology of niobium fibers at various stages of annealing at 450o C demonstrated the absence of niobium fibers coagulation process, that was initially expected by calculations of the kinetics of this process.

X-ray diffraction revealed the transformation of microstructure that is characterized by the changes in crystallography lattices of the components in the area of interphase surfaces which is caused by the changes in the level of high micro stresses that are a peculiar feature of nanostructured micro composite materials.

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