Superconducting properties of irradiated GdBCO coated conductor tapes

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The fusion of deuterium and tritium is one of the most promising options for the future energy supply. Superconductors produce the required field for the magnetic confinement of the fusion plasma. A very small fraction of the high energy neutrons which are released in this process reach the magnet components. The sensitivity of the critical currents to neutron exposure may become a selection criterion for the choice of the superconductor in fusion power plants (e.g. DEMO). A SuNAM GdBCO HTS coated conductor was studied in this context. It was fabricated using the Reactive Co-Evaporation by Deposition & Reaction (RCE-DR) method. Irradiation effects on transition temperature and critical current as a function of external magnetic field, tensile stress and angular orientation will be presented. The results were obtained from transport current measurements using the four probe technique in a continuous He-flow cryostat. After irradiation to a fast neutron fluence of $2.3 \cdot 10^{22}$ m^{-2}, the critical temperature of the tape dropped by 6 K, from 94 K to 88 K. As a consequence, the critical current was considerably reduced at high temperatures. However, it increased by 50% at 40 K and a field of 15 T when applied normal to the tape surface and by 20% for the parallel field orientation.

We wish to thank SuNAM for providing us samples of their RCE-DR GdBCO coated conductor tape.