

HIGH TEMPERATURE SUPERCONDUCTOR CURRENT LEADS

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ABSTRACT

The use of superconductors in high electrical current applications (magnets, transformers, generators etc.) usually requires cooling with liquid Helium, which is very expensive. The superconductor itself produces no heat, and the design of Helium dewars is very advanced. Therefore most of the heat loss, i. e. Helium consumption, comes from the current lead which connects the superconductor with its power source at room temperature. The current lead usually consists of a pair of thick copper wires. The discovery of the High Temperature Superconductors makes it possible to replace a part of the copper with superconducting material. This drastically reduces the heat losses because a) the superconductor generates no resistive heat and b) it is a very poor thermal conductor compared with the copper. In this work silver-sheathed superconducting tapes are used as current lead components. The work comprises both the production of the tapes and the overall design of the leads, in order to a) maximize the current capacity ('critical current') of the superconductor, b) minimize the thermal conductivity of the silver clad, and c) optimize the cooling conditions.