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FERMI SURFACE IN PHENOMENA OF CHARGE TRANSFER IN CONDUCTING MEDIA

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The problem of design of effective cryogenic energetic devices and systems advances the requirement of geometry optimization for the most magnitude of magnetic field to be obtained in the same volume at given energy supply. High conductivity of pure metals at low temperatures ensures a strong skinning of alternating current already at low frequency. So skin depth in conductor made of pure aluminum with ratio of room to residual resistance of 10000 (resistance at liquid helium temperature is of the order of $2 \cdot 10^{-10}$ Ohm·cm) at frequency of 1 Hz is only 0.1 cm. Thus such metals as Cu, Al, Bi, In may be applied to increase the energy concentration of nonstationary magnetic field by means of enlarge of local magnetic field strength.

The aim of work is to represent some novel ways of improvement of the magnetic system arrangement and efficiency via application of Hall drift for generation of additional magnetic field and increase of magnetic energy density. In cryogenic equipment at temperatures of liquid helium and nitrogen some metals as aluminum transforms into hyperconducting media, being on resistance value close to superconductors. At helium temperatures aluminum resistance is of 10^{-10} Ohm·cm. So the increase magnetic energy is possible to realized with hyperconducting pure aluminum concentrator that can be installed into traditional solenoid. Hall drift stimulated by Lorentz force in crossed electric and magnetic fields as show analysis and experiment is able to generate magnetic field having been ignored before. The properties of Hall drift of electrons and generation of respective self magnetic field have been examined on aluminum conductors. An experiment on aluminum disk like conductors having radial current between inner and outer concentric contacts have been done in axial magnetic field. Calculation of characteristics was made on the base of relations of charge flow in electric and magnetic field at respective boundary conditions. The benefits of Corbino geometry for charge flow and advantages of application of Hall drift in an external magnetic field are discussed for cryogenic temperature range.