

Dynamics of superconducting condensates within time-dependent Ginzburg - Landau theory with a complex relaxation time: history and recent development

The time - dependent Ginzburg - Landau theory with a nonzero imaginary part of the relaxation time is known to provide a useful tool for description of a number of dynamic phenomena in superconducting condensates. In this talk I will give some review of the previous related works started from the ones devoted to the vortex dynamics, Hall effect in superconducting state, physics of superconducting fluctuation phenomena, etc. The derivation and applicability of the modified time - dependent Ginzburg - Landau equations will be also analyzed. The recent development of the field will be discussed in the context of the inverse Faraday effect in superconductors, i.e., the problem of generation of the magnetic moment under the effect of the circularly polarized electromagnetic radiation. The time-dependent Ginzburg - Landau model with a complex relaxation time allows us to establish the connection between the direct and inverse Faraday phenomena in superconducting condensates.