Bardeen hysteresis: Fact or fiction?

Peter Keefe

University of Detroit Mercy, 24405 Gratiot Avenue, Eastpointe, 48021, USA

The adiabatic phase transition of a Type I superconductor particle of size d, where $\xi(\mathrm{T}) \leq d \leq 5\lambda(\mathrm{T})$, has been predicted to be accompanied by a latent heat evolution inconsistent with the second law of thermodynamics.[1] In response to this prediction, John Bardeen, in a private communication to the author,[2] proposed magnetic hysteresis at the phase transition which would provide a magnetodynamic loss of sufficient magnitude to bring the latent heat evolution into consistency with the second law of thermodynamics. This magnetic hysteresis, referred to herein as "Bardeen Hysteresis", has not been reported in the literature, and therefore, its existence is unproven and its causation, if it exists, is undetermined.[3]

[1] P.D. Keefe, U.S. Patent 4,638,197 (1987).

[2] Private letter communication of John Bardeen to the author (1987). Letter courtesy of the University of Illinois at Urbana-Champaign Archives, Record series: Box 28 of the Bardeen papers.

[3] P.D. Keefe, Physica Scripta, 151, 014029 (2012).