

Hydrodynamics of superfluid helium with superfluid entropy

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We consider an extension of the two-fluid model for superfluid helium. Over the years, two kinds of models have been proposed to describe the observations on helium II: the two-fluid model, in which the specific entropy of the superfluid is assumed to be zero, and the extended one-fluid model, derived from extended thermodynamics. Since the statement that the entropy of the superfluid fraction vanishes has not been demonstrated theoretically, here we generalize the standard (Landau and Tisza) two-fluid model allowing that a small amount of entropy is carried by the superfluid component.