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Thermodynamically stable noncomposite vortices in mesoscopic two-gap superconductors LIVIU CHIBOTARU, VU HUNG DAO, University of Leuven and INPAC — Two-gap (or two-band) superconductors such as recently discovered MgB_2 show new qualitative effects with respect to conventional ones. For example the fractionalization of the magnetic flux associated to individual vortices is predicted in massive two-gap superconductors. It can either result from the inequality of the winding numbers of the vortices in the two condensates ($L_1 \neq L_2$) having a common vortex core (composite vortices), or the vortex cores in each of the two bands can be spatially separated (noncomposite or deconfined vortices). In both cases they never correspond to the ground state, i.e. are thermodynamically unstable. Thus only the usual Abrikosov vortices are experimentally observed in massive two-gap superconductors. Within the two-gap Ginzburg-Landau theory we have found the existence of thermodynamically stable noncomposite vortices in mesoscopic superconductors in a large domain of the $T - H$ phase diagram. The appearance of these vortex phases is caused by a non-negligible effect of the boundary of the sample on the superconducting order parameter and represents therefore a genuine mesoscopic effect. For low values of interband Josephson coupling vortex patterns with $L_1 \neq L_2$ can arise in addition to the phases with $L_1 = L_2$. The calculations show that noncomposite vortices could be observed in thin mesoscopic samples of MgB_2.

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