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**Magnetization currents in thermomagnetic effects** ANDREI SERGEEV, MICHAEL REIZER, VLADIMIR MITIN, University at Buffalo — In a finite sample, besides the bulk currents given by the Kubo formula, additional charge and energy are transferred by surface magnetization currents. At the same time, electric and energy magnetization currents are divergence-free and corresponding net currents are always zero. Therefore, instead of adding the surface magnetization currents, one can subtract the bulk magnetization current. We show that for the energy current, the corresponding correction to the Kubo's bulk current is expressed in terms of the magnetization component in the Poynting vector. For the heat current any such corrections are absent. It means that magnetization heat currents are absent, obviously because of the absence of circular heat currents and circular temperature gradients. Thus, the Kubo method gives an exact expression for the heat current, while the electric current should be corrected due to magnetization contribution. This theory satisfies the Onsager relation. It is applied to fluctuation and vortex thermomagnetic effects in superconductors.

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