Heat transfer through dipolar coupling: Sympathetic cooling without contact

B. Tanatar
Bilkent University, Department of Physics, Bilkent 06800 Ankara, Turkey

We consider two parallel layers of dipolar ultracold Fermi gases at different temperatures and calculate the heat transfer between them. The effective interactions describing screening and correlation effects between the dipoles in a single layer are modeled within the Euler-Lagrange Fermi-hypernetted chain approximation. The random-phase approximation is used for the interactions across the layers. We investigate the amount of transferred power between the layers as a function of the temperature difference. Energy transfer arises due to the long-range dipole-dipole interactions. A simple thermal model is established to investigate the feasibility of using the contactless sympathetic cooling of the ultracold polar atoms/molecules. Our calculations indicate that dipolar heat transfer is effective for typical polar molecule experiments and may be utilized as a cooling process.