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Spin-electron acoustic waves: Linear and nonlinear regimes, and applications PAVEL ANDREEV, Lomonosov Moscow State University — Considering the spin-up and spin-down electrons as two different fluids we find corresponding hydrodynamic and kinetic equations from the Pauli equation. We find different pressure the spin-up and spin-down electrons due to different concentrations of electrons in the magnetized electron gas. This difference leads to existence of new branches of linear longitudinal waves propagating with small damping. These waves are called the spin-electron acoustic waves (SEAWs) due to linear dispersion dependence at small wave vectors. We obtain two waves at oblique propagation and one wave at propagation parallel or perpendicular to the external magnetic field. Dispersion dependences of these waves are calculated. Contribution of the Coulomb exchange interaction is included in the model and spectrums. Area of existence of nonlinear SEAWs appearing as a spin-electron acoustic soliton is found for the regime of wave propagation parallel to the external magnetic field. It is obtained that the SEAWs lead to formation of the Cooper pairs. This application of our results to the superconductivity phenomenon reveals in a model of the high-temperature superconductivity with the transition temperatures up to 300 K.

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