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Anomalous Hall Effect for Electrons in ^{3}He-A – A Sensitive Probe of the Quasiparticle-Ion T-matrix[1] OLEKSII SHEVTSOV, J A SAULS, Northwestern Univ — An anomalous Hall effect for electron transport in superfluid ^{3}He-A, reported by the RIKEN group, provided the first direct experimental signature of broken mirror and time-reversal symmetries in this topological superfluid. We developed a theory of the anomalous Hall effect of negative ions in ^{3}He-A, which is in quantitative agreement with the RIKEN measurements. The main ingredient to the theory is the effective quasiparticle-ion (QP-ion) interaction potential, which uniquely determines the sub-gap excitation spectrum and transport properties of the ion. Here we present our analysis of the ion mobility as a spectroscopy of the QP-ion effective interaction. We report results for a set of potentials that determine the QP-ion t-matrix, including the hard-sphere potential, constrained random-phase-shifts, and interactions with short-range repulsion and intermediate range attraction. Our analysis shows that the transverse force on the moving ion, responsible for the anomalous Hall effect, is particularly sensitive to the structure of the QP-ion potential, and that strong short-range repulsion, captured by the hard-sphere potential, provides an accurate model for computing the forces acting on the moving electron bubble in superfluid ^{3}He-A.

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