

Investigation of surface state electrons on He films at high densities

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When electrons are put on thin liquid helium films they form a nearly ideal two-dimensional coulomb systems. Due to the intrinsic stability of the films higher electron densities than on bulk helium can be reached. By increasing the density we investigate the whole phase diagram of these systems including the classical electron gas, the Wigner crystal state and the degenerate Fermi gas¹. In the experiment we focus on the transport of the electrons between two metal segments, which are used as a substrate for the helium film. The electron density on the segments is determined by measuring the density-dependent He film thickness using surface plasmon resonance. With a complementary technique we measure the displaced charges in the metal substrate, when the electron density on the liquid helium film is changing. In order to improve on the stability and the maximum density of the electron systems on the film we use in addition bare metal substrates also metal segments covered by thin polymer films.

¹T. Guenzler, B. Bintar, G. Mistura, S. Nesper, and P. Leiderer, Surf. Sci. **361/362**, 831 (1996).