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A comprehensive study and comparison of the features of the magnetic field induced superconductor-insulator transition (SIT) in heterostructures PbTe/PbS and PbTe/YbS with different topologies superconducting interface [1, 2]. The superconductivity ($Tc \leq 6.5$ K) of PbTe/PbS and PbTe/YbS heterostructures are related to the band inversion in narrow-gap semiconductors due to the elastic stress field formed by misfit dislocation networks arising at the interface between the semiconductor layers of sufficient thickness ($d > 80$ nm). If d decreases the continuity of the superconducting interface is broken, Tc decreases and the metallic type conductivity changes to a semiconductive type. It is found that the discontinuity superconducting interface is a necessary condition for the observation of the magnetic field induced SIT in heterostructures PbTe/PbS and PbTe/YbS, and significantly affects its features: a fan-like set of curves $R(T)$, intersection of curves $R(B)$, a maxima value of $R(B)$ curves and negative magnetoresistance). In heterostructures with "perfect", defect-free interface features not found SIT. Thus, the mechanism of SIT in this case is associated with percolation phenomena inherent in granular superconductors.

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Photo-electron emission directly in superfluid helium

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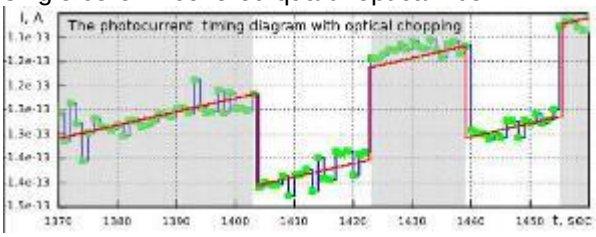
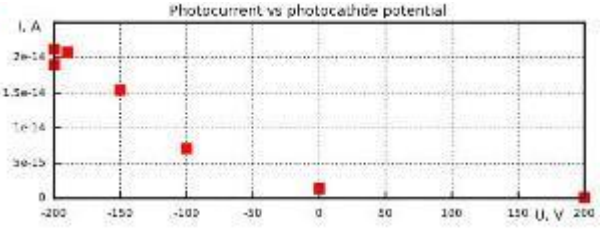
Despite the fact that the electrons in bulk helium were studied for over half a century [1], observations of new intriguing effects still appear [2]. Alas, the traditional methods of injecting electrons into bulk helium (α-sources, W-thermoemitters, discharge or field emission) lead to the generation of a large number of excitations (ions, dimers, rotons, etc.). As a result, the interpretation of experiments are not simple and sometimes may be questionable. In this respect, the photoelectron emitters [3] are more preferable and have been used, for example, for emission of electrons to the helium surface. However, the photocurrent vanishes if the photoemitter´s surface is covered with a helium film thicker than 1.5 nm [4].

We managed to achieve the electron currents (~20 fA) with photocathode immersed directly in condensed superfluid helium. The UV light (λ = 254 nm) was guided to the photocathode through a single core Al-covered quartz optical fiber.





[eff]

Using more complex MOM structure as emitter, which we are studying at the moment, we hope to significantly improve this result.

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