Simulation of liquid helium-4 in aerogel by means of the density functional theory

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The distribution of the liquid ^{4}He was investigated by means of the density functional theory[1] in the different confined geometries. The following environments were considered: adsorbing and nonadsorbing silica aerogel and homogeneous adsorbing strand. The tendency of helium atoms to adsorb on the concave aerogel surface has been demonstrated. It has been shown that in the confinement with fractional mass dimension within certain scales the liquid helium possesses the fractional mass dimension within these scales too. The dependence of the liquid helium energy on the number of atoms for different type of adsorbing surfaces was investigated as well. It has been found that the specific energy of liquid helium behaves differently in the cases of adsorbing and nonadsorbing external potentials, what indicates the nonextensivity of the system under consideration. Thus the necessity of taking into account the surface effects and the fractional mass dimension in the studies of the properties of liquid helium[2,3] in a restricted space geometry has been demonstrated.

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