

Helium surface electron attachment to atomic hydrogen in applied magnetic field

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Our prior measurement shows that in a two-dimensional mixture of electrons and hydrogen atoms on liquid helium surface, an electron attaches to a hydrogen atom to form a negative hydrogen ion H^- . In order to find out the mechanism of electron attachment reaction, we measured the magnetic field dependence of the reaction rate up to 11 tesla below 1 K. We find that the reaction rate coefficient behaves inversely proportional to the square of applied magnetic field and its value above 5 tesla is eight orders of magnitude smaller than the zero field value. This result is understood that electronic spin singlet collision can produce H^- , i.e., a spin 'down' surface electron and the electronic spin 'up' component of so called a -state hydrogen atom.