Interaction of Excimer He_2^* Molecules with Vortex Lines in Superfluid ^{4}He at $T < 0.2$ K

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We have studied the interaction of metastable spin-triplet He_2^* molecules with quantized vortices in superfluid ^{4}He in the zero temperature limit. The molecules were generated during an injection of electrons from a sharp metal tip at high voltage, and detected as current into a metal collector after their ionization in high electric field. The molecules were only detected at temperatures $T < 0.2$ K. The presence of ^{3}He impurities at the level of 0.3 ppb strongly suppressed the detected signal; the temperature dependence of the detected signal revealed a sharp peak, most probably associated with the condensation of ^{3}He atoms on vortex cores. The vortices were created by either rotation or ion injection.The trapping diameter of the molecules on quantized vortices was found to be 96 ± 6 nm at pressure of 0.1 bar and 27 ± 5 nm at 5.0 bar. We have also demonstrated that a moving tangle of vortices can carry the molecules through the superfluid helium [1].

1. D. E. Zmeev et al., Phys. Rev. Lett. 110, 175303 (2013).

Section: VT - Vortices and turbulence

Keywords: quantum turbulence, excimer molecules, superfluid helium