Formation of Negative Ions of Mercury

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Nature, 135, 999 (**1935**)

With the mass-spectrograph by means of which we established the formation of diatomic mercury molecules by electron impact, we have now made an investigation of negative ions. No trace of a stable negative molecular ion was detected, but negative atomic ions were found in considerable number.

The ions are formed at a point in the electric field close to the filament. The probability of electron attachment as a function of the energy of the electrons attains a maximum between 0 and 5 volts, then falls to almost zero for electron energies above about 5 volts.

In addition to these ions, which have 0-5 volts less energy than they would have if they had originated on the filament, a small number of fast negative ions, having energies up to 10 volts more than the total potential across the tube, have been detected.

The presence of fast ions suggests dissociating molecules. However, the ionization potential of the mercury molecule is found by us to be 9.65 volts. Consequently, if the whole electronic energy of an exited molecule were converted into kinetic energy of the constituent atoms, each atom could have at the most only 4.8 volts energy. The origin of these fast ions is now being investigated.