GEC15-2015-000650

Abstract for an Invited Paper
for the GEC15 Meeting of
the American Physical Society

The Gaseous Electronics Conference in its seventh decade: some new problems in an old field[1]

TIMOTHY GAY, University of Nebraska

Our understanding of scattering processes involving atoms and molecules is the foundation of the science of gaseous electronics. As fields of physics and chemistry, both atomic and molecular collisions and gaseous electronics originated in the early 20th century, and they have developed symbiotically and in parallel since then. Despite a century of progress since the Franck-Hertz experiment however, it is fair to say that the field of atomic and molecular collisions is old and well-explored, but not mature. While the electron-atomic hydrogen problem has been solved in complete detail [1], there are large regions in the "great outback" of the periodic table where either theory or experiment (or both) are nonexistent, or there is little correlation between the two. The problem becomes dramatically worse with molecules, including those with just one atom too many [2]. As applications of gaseous electronics have become both more sophisticated and more complicated, the demands for basic, accurate cross section data, especially for heavy, polyatomic molecular constituents, have escalated accordingly. This talk will review the status of our theoretical understanding of atomic and molecular collisions, and will present several case studies involving targets of He, H_2, Zn, H_2O, and $C_{10}H_{15}IO$ to illustrate current problems in the field. We will also consider crucial needs for basic collisional data in recent applied plasma science problems [3].

[1] T.N. Rescigno, M. Baertschy, W.A. Isaacs, and C.W. McCurdy, Science **286**, 2474 (1999)
[2] J.W.Maseberg, K. Bartschat, and T.J.Gay, Phys. Rev. Lett. **111**, 253201 (2013)
[3] See. e.g., N. Mason, http://meetings.aps.org/link/BAPS.2013.GEC.ET5.2

[1]Work supported by the NSF through grant PHY - 1505794.