“Universal” theoretical approach for determination of cross sections for dissociative recombination, rotational, vibrational, electronic excitation of molecular ions

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Plasma at relatively low temperatures, a few eV and below, contains not only atomic, but also molecular ions. This is the reason why molecular ions play an important role in plasma properties, its evolution and decay at low temperatures. Thus, it is important to take the molecular ions into account when one deals with low-temperature atomic plasma. Depending on the temperature, electronic (for T<10 eV), vibrational (T<1 eV), or rotational (T<0.0.5 eV) structure of the molecular ions should be accounted for to describe the behavior of the plasma. Measuring cross sections for different processes involving the molecular ions is difficult, especially because dozens or even hundreds of processes should be taken into account for a reasonable modeling of plasma. In this situation, plasma modeling should rely on theoretical approaches for determination of properties and cross sections of species present in molecular plasma.

It this talk, I will describe different theoretical techniques developed during the last decade to compute cross sections for different processes involving electron-molecule collisions: dissociative recombination, rotational, vibrational, electronic excitation of molecular ions, dissociative electron attachment to neutral molecules, radiative processes in electron-molecule collisions.