RESONANCES IN LOW-ENERGY ELECTRON AND POSITRON SCATTERING UPON ENDOHEDRALS

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In this talk we present some specific features of low-energy electron and positron scattering upon endohedrals and fullerenes. We demonstrate a number of minima and maxima, like, for example, the Ramsaue rminima in partial wave contribution to the total cross-section, their reflection in the differential cross-section at a given angle *etc*. We demonstrate, that completely new structure appears in the cross-section of electron and positron scattering that originates due to presence of a single atom *A*, stuffed inside a big fullerene C_N, thus forming an endohedral $A@C_N$.

Itisofinteresttonotethatthecontributionofanatom*A*isclearlymanifestedinthetotalcross-sectionof a bigsystem $A@C_N$. Without any doubt, this is a strong evidence of the quantum nature of the considered scattering process. In classical physics the scattering cross-section, at least in the low-energy limit,is determined by the size of the target and the radius of the projectile-target interaction.

In our calculations we took into account both the static field of the target $A@C_N$ and the polarization of *A* and C_N in the process of collision, as well as the interference of the *A* and C_N polarizabilities. The concrete calculations for electron scattering were performed for several atoms $A = Ne, Ar, Xe,$ and Ba. As a fullerene, we consider C_{60}. This choice permits to simplify the calculations considerably, since C_{60} is almost ideally spherical and the atom *A* can be treated as located at the very center of C_{60}. We found that the presence of *A* modifies considerably the $A@C_N$ scattering cross-section, adding to its new resonances. We have also predicted the appearance of additional bound states $eA@C_N$, it is formation of negative ions $A@C_N{}^-$. In the generation of new structures the role of interference of *A* and C_{60} polarizabilities is essential.

At first glance, the positron e^+ scattering upon $A@C_N$ is an easier object of investigation than the electron e^- scattering, since for e^+ there is no exchange between the projectile and target's constituencies. However, this is not the case, since in the process of collision the projectile e^+ and a virtually excited target electron can form a temporal bound state that we call *virtual positronium* $\tilde{P}s$. We took this effect into account shifting the energy of virtual excitations by the *Ps* binding energy value, I_{Ps}. This shift increases considerably the value of *A* and C_{60} polarizabilities. It can also chance sign of polarizabilities, thus leading to a paradoxical situation of repulsive polarization potential, contrary to known from textbook statement that polarization potential has to be attractive for any sign of the projectile charge.

Concrete results were obtained for a relatively simple endohedral $He@C_{60}$. The cross-sections for e^+ and e^- are essentially different and are strongly affected by the energy shift in polarizabilities.

Entirely, the investigation of $e^{\pm} + A@C_N$ is interesting and promising.