FIZIKA 2 Suppl. 1 (1970)

SECTION 1 — ATOMIC COLLISION PROCESSES

1.1 Resonant charge transfer in $O^- - O$ slow collisions

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Abstract

A general asymptotic expression for the energy separation $\Delta(R)$ of the symmetrical and antisymmetrical states in the (A^-, A) system is derived. A great influence of the atomic short-range forces on $\Delta(R)$ has been found. At large values of the atomic effective range r_0 the present expression for $\Delta(R)$ leads to the previous result of the authors, and for small r_0 a Smirnov's like behaviour of the molecular term splitting is obtained. As an application of the obtained result on $\Delta(R)$, the resonant charge transfer in $O^- - O$ collisions is calculated and a comparison with the experimental data is made.

1.2 Electron detachment processes in the collision of C^- and O^- with gases

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Abstract

Electron detachment processes of negative ions C^- and O^- were investigated in the energy range of 5—30 keV, and Ne, Ar, Kr, Xe and N_2 were used as target gases. The cross section values of one-, two- and three-electron loss processes were measured in the single collision conditions. Ion beams of C^- and O^- were produced by two-electron capture process during the passage of C^+ and O^+ beams through the charge-changing chamber. The cross sections of one-, two- and three-electron loss processes were measured by detecting the yield of fast A°, A^+ and A^{2+} particles during the passage of primary A^- particles through the interaction chamber.

One-electron loss cross sections ($\sigma_{\bar{1}0}$) vary in the range of 10^{-16} up to 10^{-15} cm^2/part, while those of two-electron loss process ($\sigma_{\bar{1}1}$), are, in general, lower for an order of magnitude. In some cases, as for O^-/Ne, two-electrons loss cross sections ($\sigma_{\bar{1}1}$) are very close to those for one-electron loss process ($\sigma_{\bar{1}0}$). Three-electron loss cross section values vary in the range of 10^{-19} up to 10^{-17} cm^2/part. One-electron loss cross sections ($\sigma_{\bar{1}0}$) increase with the atomic number of the target, as $Z^{2/3}$, and their values are higher in the case of primary ion with the lower electron affinity, as C^-. Two-electron loss cross sections ($\sigma_{\bar{1}1}$) are higher for the primary ion C^- with the lower first ionization potential, and, in general, their values decrease with increasing gas target mass number Z. In accor-