Comment on "Evidence for Correlated Double-Electron Capture in Low-Energy Collisions of O^{6+} with He"

Stolterfoht *et al.*[1] have recently claimed that in O^{6+}(60 keV)-He collisions correlated double-electron capture (CDC) is of similar importance as uncorrelated double-electron capture. This claim has been based on a comparison of electron emission from $O^{4+}(2p,nl)$ states $(n \geq 6)$ and $O^{4+}(3l,n'l')$ states $(n' \geq 3)$, respectively, the former being assumed to result from CDC only. Our recent studies on total double-electron capture to bound O^{4+} states[2] and on electron emission from the above mentioned autoionizing states[3] show that the conclusions of Stolterfoht *et al.*[1] on the importance of CDC are probably not fully justified.

First, double-electron capture into bound states has been neglected entirely, but at 60 keV impact energy involves a cross section[2,4] of about 1.6×10^{-16} cm^2. With the data of Stolterfoht *et al.*[1] for double-electron capture into autoionizing states a CDC fraction of not more than 15% would be concluded. Second, the CDC processes invoked by Stolterfoht *et al.*[1] are probably not exclusively responsible for production of autoionizing $O^{4+}(2p,nl)$ states, which could, e.g., also result from sequential single-electron capture events during one single collision

$$O^{6+}+He \rightarrow O^{5+}(3l)+He^{+} \rightarrow O^{4+}(2p,nl)+He^{2+}.$$

The first step has been shown[5] to account almost exclusively for a total single-electron capture cross section[2,4] of about 1.3×10^{-15} cm^2. The second step involves a correlated two-electron transition which at a crossing distance of less than about $3a_0$ can populate bound $O^{4+}(2p,nl)$ states with $n \leq 5$, whereas for a larger crossing distance unbound states as observed by Stolterfoht *et al.*[1] may result. Such correlated transitions or configuration interactions are rather commonly observed for electron capture from He, e.g., by C^{3+} (Ref. 6) or N^{4+}.[7]

Finally, our studies on electron emission from autoionizing O^{4+} states[3] seem to indicate that the fraction from $O^{4+}(2p,n \geq 6,l)$ states is considerably less important than that from $O^{4+}(3l,n \geq 3,l')$, and therefore quite unimportant for the total double-electron capture.

Consequently, there is some doubt about the importance of CDC in O^{6+}-He collisions. Note also that recently more general arguments have been published[8] for the dominance of uncorrelated double-electron capture in collisions of highly charged $(q \geq 7)$ ions with He.

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