Fraction of Metastable 1s2s ^{3}S ions in fast He-like Beams (Z = 5-9) Produced in Collisions with Carbon Foils

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Abstract. Auger spectroscopy has been used to measure the fraction of metastable 1s2s ^{3}S ions in fast He-like B, C, N, O, and F beams produced in collisions with thin Carbon foils as a function of both the incident energy in the range of 0.5 to 2 MeV/u and the foil thickness in the range of 1-5 μg/cm^2. The method used for determination of the metastable fraction is based on measurements of the electron emission from the doubly excited states of Li-like ions formed in collisions of primary beams with hydrogen and helium targets. Some differences were observed both in the energy dependence and the absolute value of metastable fractions for different beams. In particular, the metastable content in C^{4+} ions produced in carbon foils was found to be significantly lower than that of other investigated beams. The observed deviation has been explained as due to K-vacancy sharing, which is known to have the highest probability for symmetric collisions. A model recently proposed for the calculation of the metastable fraction in He-like beams has been used to predict the metastable fraction for B^{3+} ions leading to good agreement with the experiment.