Measurement of cross-sections for ^{181}Ta(e, e'xn; x=1–8)$^{181-x}$Ta reactions at $E_{e\ max}$ = 20–110 MeV

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In this study, the cross sections for the ^{181}Ta(e, e'xn; x = 1–8)$^{181-x}$Ta reactions induced by electrons, of which energies ranging from 20 to 110 MeV, were investigated using the residual γ-activity method. The objective was to elucidate the nuclear excitation processes and the resultant distribution of product nuclei. This study was conducted for the following purposes: (1) The measurement of (e, e'xn) cross sections allows for the evaluation of neutron flux from electron-induced neutron sources, which might be more beneficial in high-energy-resolution fast neutron resonance analysis compared to bremsstrahlung photoneutron sources, since electron-induced neutron sources may facilitate the realization of a point source with a narrow distribution in the four-dimensional x-y-z-t space. (2) Measuring these cross sections aids in enhancing our understanding of relativistic lepton Coulomb excitations processes. (3) Compared to real photons from bremsstrahlung radiation, virtual photons transferred to target nuclei in electron related Coulomb excitation carry more high angular momentum components, aiding in the evaluation of transition strengths, such as B(E2), in nuclei. To our knowledge, it is the first time that cross-section data for ^{181}Ta(e, e'xn; x = 1–8)$^{181-x}$Ta reactions in the energy range of 30 to 110 MeV have been obtained. Discrepancies between the measured cross sections for ^{181}Ta(e, e'xn; x = 1–8)$^{181-x}$Ta reactions and those of theoretical calculations were observed and discussed as well.