Spectra of Cascading Photons Induced in Charge-Exchange Collisions: Theory and Modeling

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Theoretical aspects of the charge-exchange mechanism of X-ray and EUV emissions, induced in collisions of highly charged ions with neutral atoms and molecules, are discussed in detail. Astrophysical applications of the charge-exchange mechanism of X-ray emission are considered. Spectra of X-ray and EUV photons, emitted by heavy solar wind ions in collisions with atoms of the interstellar gas and planetary and cometary gases, are constructed. Relation between intensities of X-ray, EUV, and optical cascading photons is analyzed and compared with the laboratory and observational data. Polarization of the background X-ray emission induced in interaction between the solar wind and heliospheric neutral gas is analyzed and computed for different solar conditions.