Photoionization Cross Section for H@Cn${\text{H@C}}_{n}$ Implanted in Nonideal Classical Plasmas

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Abstract

In this study, photoionization cross sections of guest hydrogen atom in endohedral fullerene (H@Cn${\text{H@C}}_{n}$) modeled by the Woods-Saxon confinement potential implanted in the nonideal classical plasma (NICP) under spherical confinement are reported for the first time in the related literature. The relevant wave equation is solved numerically via the tridiagonal matrix method and then the energy levels, bound and continuum wave functions are interpreted. Plasma effect is examined by considering plasma temperature and density and is evaluated in the photoionization process. Since the plasma modifies the discrete and continuum spectra by changing the potential energy of hydrogen atom, it closely affects the overlapping of the wave functions of ground state and continuum state. This effect has a distinct response on photoionization resonances. Using different values of endohedral confinement parameters, which means regarding different types of fullerenes, detailed analysis of energy levels, bound and continuum wave functions, and photoionization cross sections are provided by evaluating confinement width, depth, smoothing effect and distance from the spherical encompassement center. The photoionization process of H@Cn${\text{H@C}}_{n}$ implanted in the NICP (nonideal classical plasma) is highly sensitive to both plasma and endohedral confinement. At this sensitivity, Cooper resonance character is like an encoder for fullerene structure.

Keywords

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