

DELAYED ABSTRACTS

Super-Radiant Emission Spectra of Tryptophan under UV Exposure for Biomedical Applications

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Abstract: We proposed a model of super radiant Raman scattering with substantial conversion into Stokes for the description of super-radiance in Tryptophan injected into biomolecules proteins. This paper further explores the coherent radiative processes in Tryptophan. We propose a master equation formalism to describe the super-radiation phenomenon, accounting for critical radiation parameters such as pulse duration, field intensity, and resonant frequency. We experimentally characterize the evolution of absorption and emission spectra of Tryptophan under targeted Ultraviolet C (UVC) irradiation. A detailed analysis is provided regarding the wavelength-dependent response and the intensity-driven photochemical alterations of the amino acid. Furthermore, the research investigates the correlation between the electronic relaxation of Tryptophan and the germicidal efficacy of UVC radiation on yeast cultures. By examining the photo-induced damage to protein-based dielectric structures, it is demonstrated that the fundamental role of radiative transitions in determining the stability and biological activity of microorganisms. The findings contribute to the development of advanced photonic tools for biomedical sensing and sterilization technologies.

Keywords: Raman scattering, Ultraviolet-irradiation, Emission spectra, Biomolecules.

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