

A novel experimental approach to probe the effect of environment on fluorescence properties of molecular ions

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Fluorescence is a widely employed technique in bio-imaging and diagnostics in biomedical applications. One of the most commonly used molecule for such applications is fluorescein [1, 2]. It is a highly fluorescent synthetic organic dye molecule [1, 3, 4]. Of its seven prototropic forms, the di-anion is responsible for its highest fluorescence quantum yield (0.93) which, however, is only limited to aqueous environment [3, 4, 5]. The absence of fluorescence (or very low fluorescence quantum yield) in gas-phase is attributed to an alternate de-excitation pathway – the photodetachment [3]. The detection of fluorescence from molecules with low quantum yield is very challenging and hence the work addressing such problems is sparse. Our objective is to address this problem by a novel experimental approach by observing the change in fluorescent properties of the di-anionic form of fluorescein under microsolvation combined with the measurement of photodetachment yield. We also intend to perform electronic structure calculations to complement the experimental observations. The outcomes from this combined experimental and theoretical approach is expected to yield a deeper insight into the fluorescence properties of fluorescein and similar complex organic molecules such as green fluorescent protein (GFP). In this talk, I will discuss the ongoing experimental developments at IISER Tirupati to achieve this goal.

References

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