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## Solvent effect on multiple emission and ultrafast dynamics of higher lying excited states

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### Abstract:

We present ultrafast-depopulation-dynamics of higher-lying-excited-states using femtosecond fluorescence up-conversion techniques for two near-infrared (NIR) tricarboyanine dyes (IR144 and IR140) in primary alcohols. With visible excitation wavelengths, such dyes show two distinct emission-bands with large peak wavelength difference: one at the visible region:  $S_2 \rightarrow S_0$ , and the other at NIR region:  $S_1 \rightarrow S_0$ . We show that exact band-positions, intensities, and fluorescence-decay-timescales ( $\tau$ ) depend strongly on viscosity and polarity of solvents. Interestingly, though the faster component of  $\tau$  increased for IR144 with increasing viscosity and chain-length of alcohols, the reverse was seen for IR140, indicating the possible formation of ion-pair of IR140 with alcohols.

### Introduction:

Two tricarboyanine dyes, namely, IR144 and IR140, are popularly used for research work due to their very high absorption cross-sections at 800 nm and large solvent dependent Stokes shifts<sup>[1]</sup>. Strong fluorescence emission of these two dyes has made them useful for bio-imaging applications in the biological transparent window (BTW) region<sup>[2], [3], [4]</sup> (650-900 nm) in comparison to the other NIR dyes as they have lesser photodamage, lesser light scattering and

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