Investigations on a Universal Relationship Between Optical Emission and Absorption of Complex Molecules in Liquid Solutions

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Based on a universal relationship between the extinction coefficient and the fluorescence intensity in their overlapping region, local temperatures T^* higher than the ambient T were determined for short-lived luminescent molecules of lifetimes from 7 ps to 77 ps. The reason for such a local temperature T^*, which holds also during the emission process, is the non-establishment of statistical equilibrium over the vibrational levels of excited molecules. It is found that the intensity distribution in the fluorescence band depends slightly on the wavelength of the excitating light, which evidences the lack of thermal equilibrium with the vicinal surrounding.

Key words: Universal Relationship between the Absorption and Fluorescence Spectra; Local Temperature; Statistical Equilibrium.