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radiative energy transfer

Also contains definition of: trivial energy transfer

Transfer of excitation energy by radiative deactivation of a donor molecular entity and reabsorption of the emitted radiation by an acceptor molecular entity.
Notes:

1. Radiative transfer results in a decrease of the donor fluorescence intensity in the region of spectral overlap. Such a distortion of the fluorescence spectrum is called inner-filter effect.
2. Radiative energy transfer depends on the shape and size of the vessel utilized and on the configuration of the latter with respect to excitation and observation.
3. The fraction a of photons emitted by D and absorbed by A is given by

$$a = \frac{1}{\Phi_{\mathrm{D}}^{0}} \int_{\lambda} I_{\lambda}^{\mathrm{D}}(\lambda)\,[1 - 10^{-\varepsilon_{\mathrm{A}}(\lambda)\,c_{\mathrm{A}}\,l}]\mathrm{d}\lambda$$

where c_{A} is the molar concentration of acceptor, Φ_{D}^{0} is the fluorescence quantum yield in the absence of acceptor, l is the thickness of the sample, $I_{\lambda}^{\mathrm{D}}(\lambda)$ and $\varepsilon_{\mathrm{A}}(\lambda)$ are the spectral distribution of the spectral radiant intensity of the donor fluorescence and the molar decadic absorption coefficient of the acceptor, respectively, with the normalization condition $\Phi_{\mathrm{D}}^{0} = \int_{\lambda} I_{\lambda}^{\mathrm{D}}(\lambda)\mathrm{d}\lambda$.

For relatively low absorbance, a can be approximated by

$$a = \frac{2.3}{\Phi_{\mathrm{D}}^{0}}\, c_{\mathrm{A}}\, l \int_{\lambda} I_{\lambda}^{\mathrm{D}}(\lambda)\, \varepsilon_{\mathrm{A}}(\lambda)\mathrm{d}\lambda$$

where the integral represents the overlap between the donor fluorescence spectrum and the acceptor absorption spectrum.

Source:
PAC, 2007, *79*, 293 *(Glossary of terms used in photochemistry, 3rd edition (IUPAC Recommendations 2006))* on page 411

