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Fluorescence concentration quenching in solutions of Zinc-containing and non-containing phthalocyanines

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Both metal-containing (MPc) and non-containing phthalocyanines (Pc) are materials covering large scope of interest and applications: the materials are used in organic photovoltaic elements and in photodynamic therapy. Moreover, nowadays, when the mankind extremely needs green energy transition, Pcs attract a tremendous interest as a model system of artificial photosynthetic antenna. Another inspiring property of Pcs is aggregation-related electronic properties. One of them is concertation quenching (CQ)—the drop of fluorescence (FL) quantum yield, observed at high concertation [1]. CQ results in the energy loss, hence, usually it should be minimized or at least controlled.

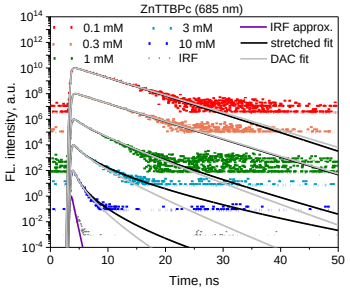

Fig. 1 ZnTTBPc FL kinetics

In this study we investigate CQ dynamics of both MPc (ZnTTBPc) and Pc (TTBPc) by varying concentration of Pcs by two orders of magnitude, from 0.1mM up to 10mM. We concentrate on time-resolved FL dynamics and explain its behavior by fitting with several model functions (see Fig. 1). CQ origin is explained in terms of Förster resonant energy transfer [2] with so-called donor-acceptor ('DAC') model (Fig. 1), when single donor is surrounded by an infinite number of acceptors (aggregates), causing FL quenching. This model helps us to estimate such an important characteristic of the molecule, as Forster radius R_F.

REFERENCES

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[2] T. Förster; Ann. Physics **437** (1948) pp. 55–75