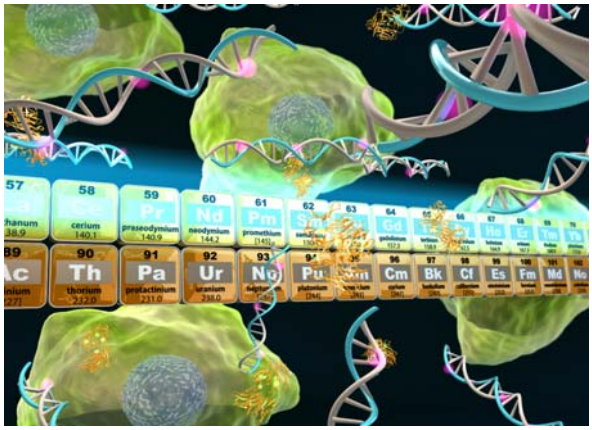
Time-gated FRET biosensing: Rapid, sensitive, and multiplexed absolute quantitation of biomarkers

Niko Hildebrandt

NanoBioPhotonics, Institute for Integrative Biology of the Cell (I2BC), Université Paris-Saclay / Université Paris-Sud / CNRS / CEA, Orsay, France (www.nanofret.com, niko.hildebrandt@u-psud.fr)

Determination of biomolecular recognition via Förster Resonance Energy Transfer (FRET) plays an important role for quantifying concentrations and distances in many fields of the life sciences.[1] The application of time-gated photoluminescence spectroscopy and microscopy for the analysis of FRET systems offers several advantages concerning versatility, sensitivity, and specificity. Luminescent lanthanide complexes, and in particular Tb complexes, exhibit extremely long luminescence lifetimes and multiple narrow emission peaks over a broad spectral range. These photophysical features make them highly interesting FRET donors in combination with different FRET acceptors, such as organic dyes or semiconductor quantum dots.[2-8] Such FRET pairs have been successfully used for the multiplexed and highly sensitive detection of protein, peptide, DNA, and RNA biomarkers.



The presentation will give an introduction to time-resolved and time-gated FRET and explain the specific benefits of lanthanide/dye/quantum dot FRET pairs for luminescence detection. Then, the application of these FRET pairs in different homogeneous single-step FRET biosensors for the sensitive and specific detection of multiple biomarkers from low-volume liquid samples or on cell membranes and inside cells will be discussed. These Tb-based FRET biosensors provide a rapid, simple, selective, and sensitive tool for multiplexed detection of various oligonucleotides or proteins, which makes them highly interesting for clinical diagnostics and other biosensing applications.

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