INF 19
Charakterisierung von Fluorophoren/Characterization of Fluorophores

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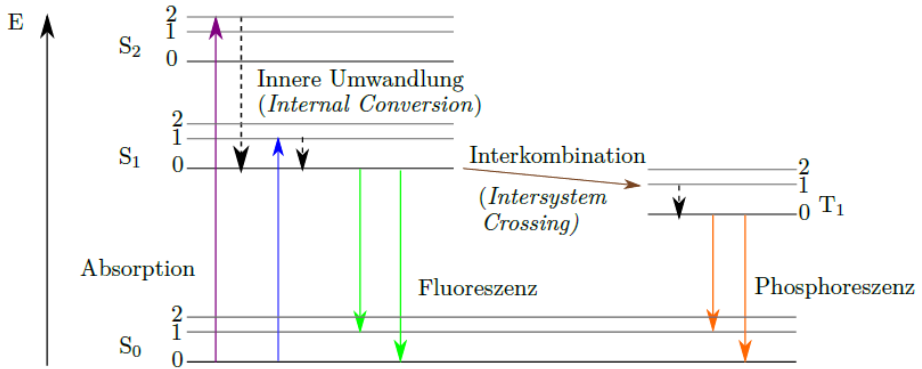
TSCPC Fluorescence

The experiment:

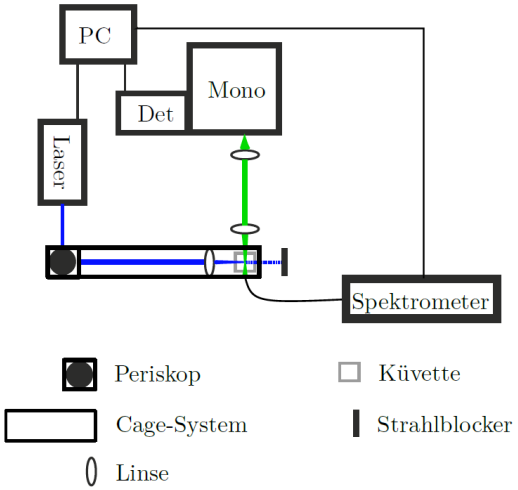
- Understanding the fluorescence properties of coumarin dyes
- Used experimental techniques:

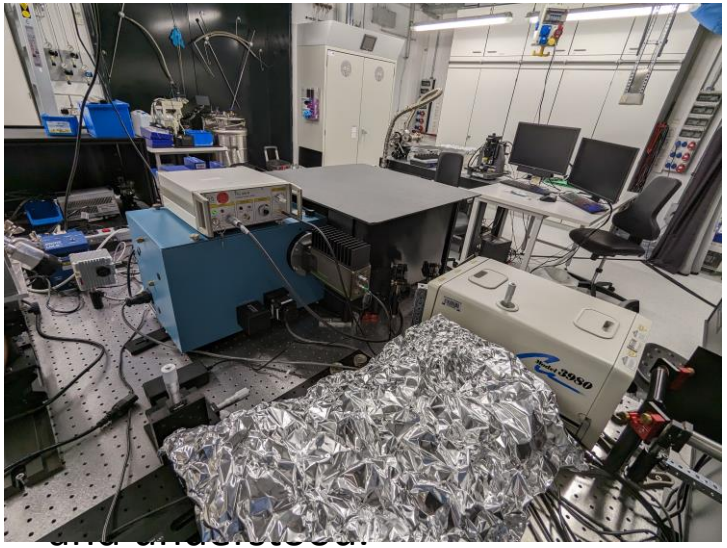
  - Dilution Series
  - UV/Vis spectroscopy,
  - Emission spectroscopy,
  - Time-correlated single photon counting (TCSPC)



Setup

Experimental Time-Resolved Fluorescence Setup





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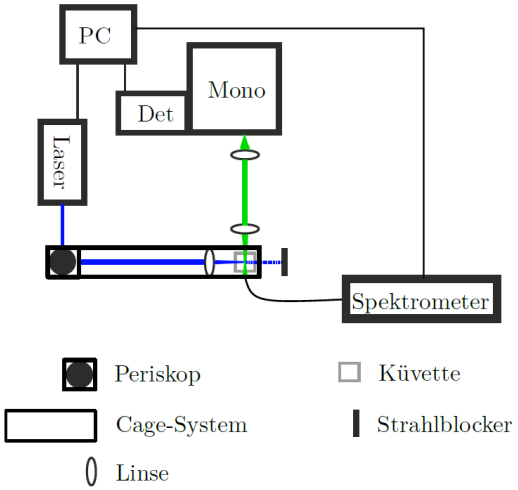
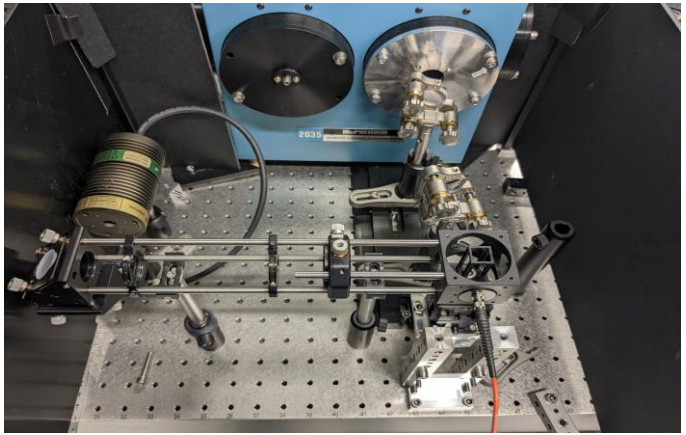
Experimental Time-Resolved Fluorescence Setup

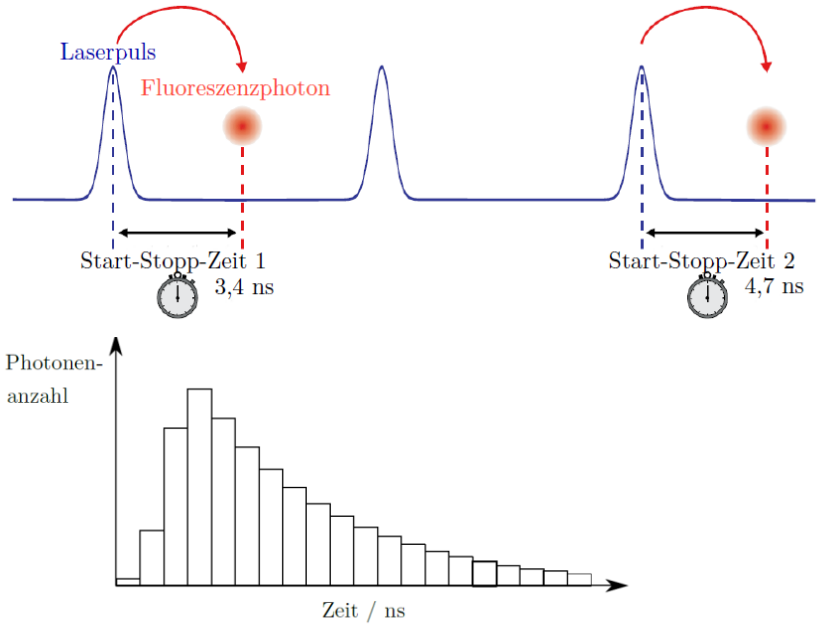




The setup and all essential parts can be easily viewed, explained and understood.

Aim and precision

Measurement Technique

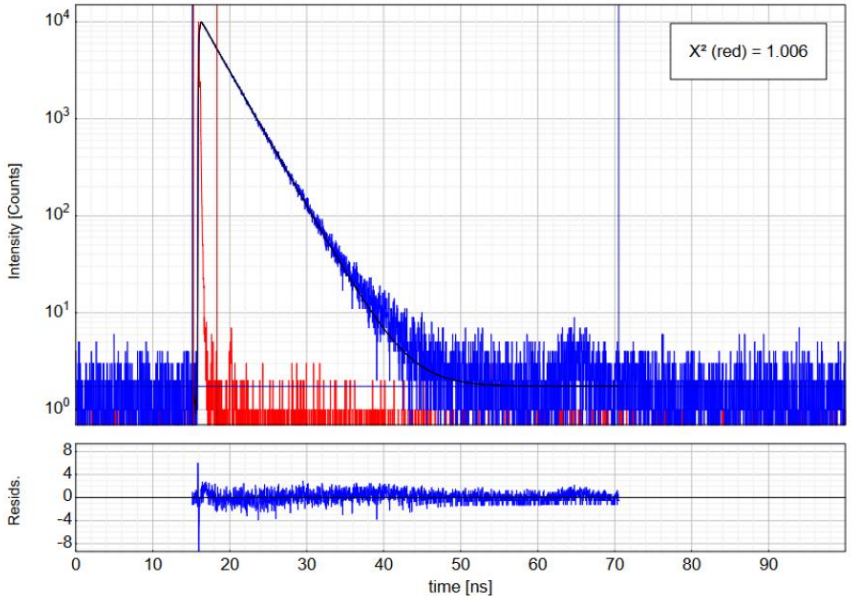


Time correlated single-photon counting (TCSPC):

- Live view on histogram development over time
- Students gain practical understanding of an important standard technique
- Precision: ca. 10ps; state of the art

Specific points of reflection

Data Analysis

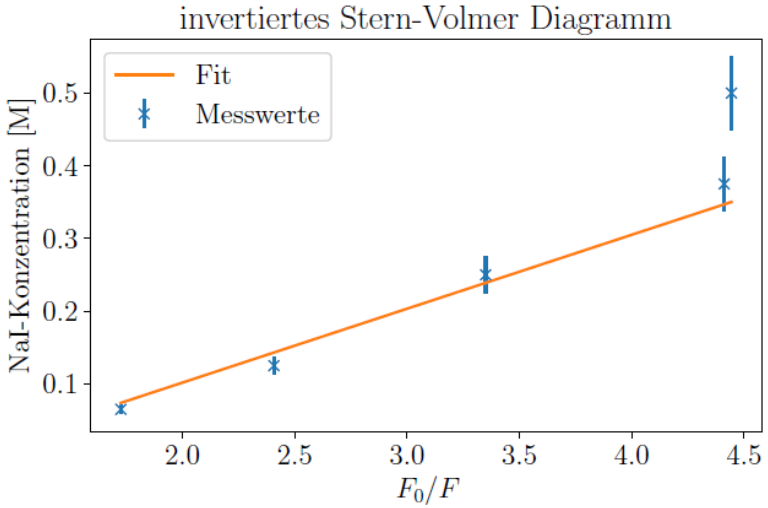


… is a key aspect of the experiment.

(1) Fit of the exponential decays directly in the lab and deconvolution of the instrumental response function (-> Fitting software provided)

Specific points of reflection

Data Analysis



(2) Application of theories to the data after the experimental phase (Analysis phase).

E.g. linear fit to fluorescence intensity as a function of quencher concentration. Often deviations from linear behavior at high concentrations. Students have to evaluate and discuss this.

Specific points of reflection

Key scientific learnings

Students learn:

- How to work in a **chemistry room**? (Sample preparation, Handling of solvents, etc.)
- How does a **laser laboratory** look like? (Applied Optics Group: Resonance, time resolved, nanofocus Raman Spectroscopy, time resolved Fluorescence)
- How to record **meaningful datasets** (inkl. reference measurements, instrumental response,…)
- How does **single photon counting** work?
- Application of theoretical models towards a fit function. **From the simplest model to more complex ones…**

Grade your experiment

- Theory: different Laws and dependencies, interdisciplinary
- Setup: stretching over 2 labs (chemistry/optics), everything hands-on
- Data taking: on site-analysis and adjustment, references…,
- Analysis: Using different theoretical models to fit, non-model behaviour of samples

Theory / preparation	Setup / experimental	Data taking	Analysis	Protocol
3	2	3	2	2-3

Specific points of reflection

Link to modern research in the physics department

RESEARCH ARTICLE

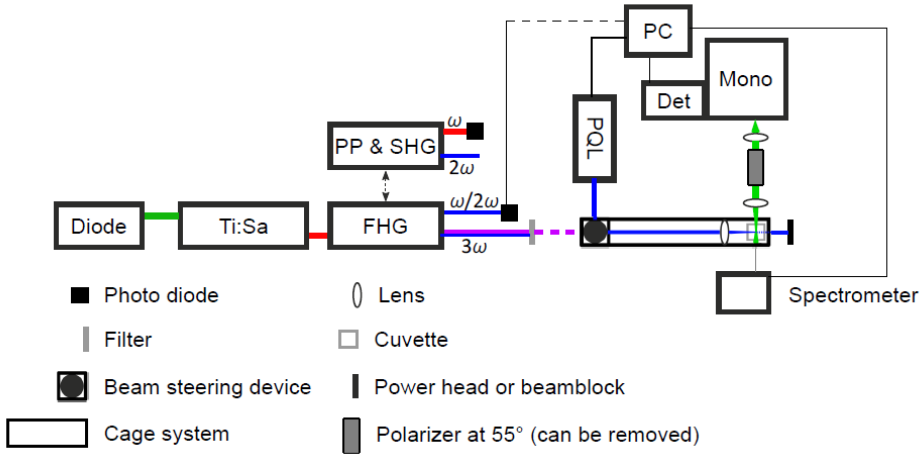
ADVANCED MATERIALS
www.advmat.de

Photoluminescence of Fully Inorganic Colloidal Gold Nanocluster and Their Manipulation Using Surface Charge Effects

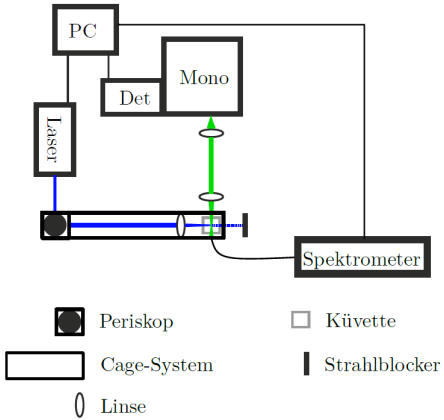
*Anna R. Ziefuss, Torben Steenbock, Dominik Benner, Anton Plech, Jörg Göttlicher, Melissa Teubner, Benjamin Grimm-Lebsanft, Christoph Rehbock, Clothilde Comby-Zerbino, Rodolphe Antoine, David Amans, Indranath Chakraborty, Gabriel Bester, Milen Nachev, Bernd Sures, Michael Rübhausen, Wolfgang J. Parak, and Stephan Barcikowski**

Specific points of reflection

Our State of the Art Setup



F-Praktikum Setup



Same setup, with a simplified laser system. However, the full laser system is visible and presented to the students during a lab tour.

Specific points of reflection

Strengthen the research/INF connection

Including Nanoparticles:

- Plasmonic
- Confined/semiconductor
- Solvent/ligand effects
- Size
- Scattering

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