Advancing cancer detection: Multi-photon microscopy setup for NADH and FAD fluorescence analysis

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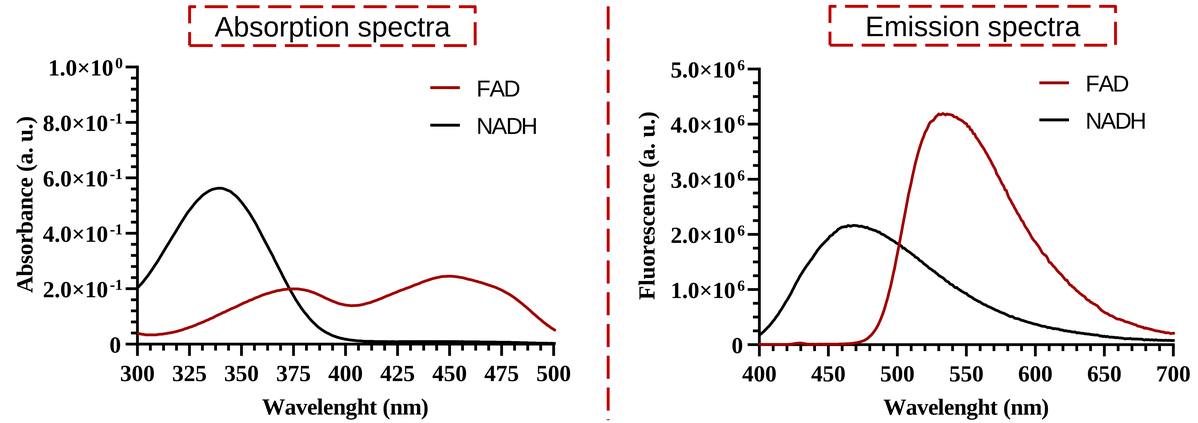
Abbreviated abstract: Multi-photon microscopy (**MPM**) revolutionizes cancer diagnosis and can replace histopathology during colonoscopy. Based on **endogenous fluorophores** such as **NADH** and **FAD**, MPM offers high sensitivity. This technique enables real-time imaging and optical sectioning, potentially enhancing early-stage colon cancer detection [1,2]. The focus of this work is on the implementation of an MPM setup for NADH and FAD detection. A future integration of a **MPM probe in conventional colonoscopy** may offers in vivo optical biopsy, **advancing cancer monitoring** and diagnosis in early-stage cancer detection.

Related publications: (up to 2 references)
– [1] A. Podder *et al*, Sensors and Actuators B: Chemical (324), (2020)
– [2] R. Cao *et al*, Journal of Biomedical Optics (25), (2020)

POM
Photonics Online Meetup

Previous work, challenge, and approach

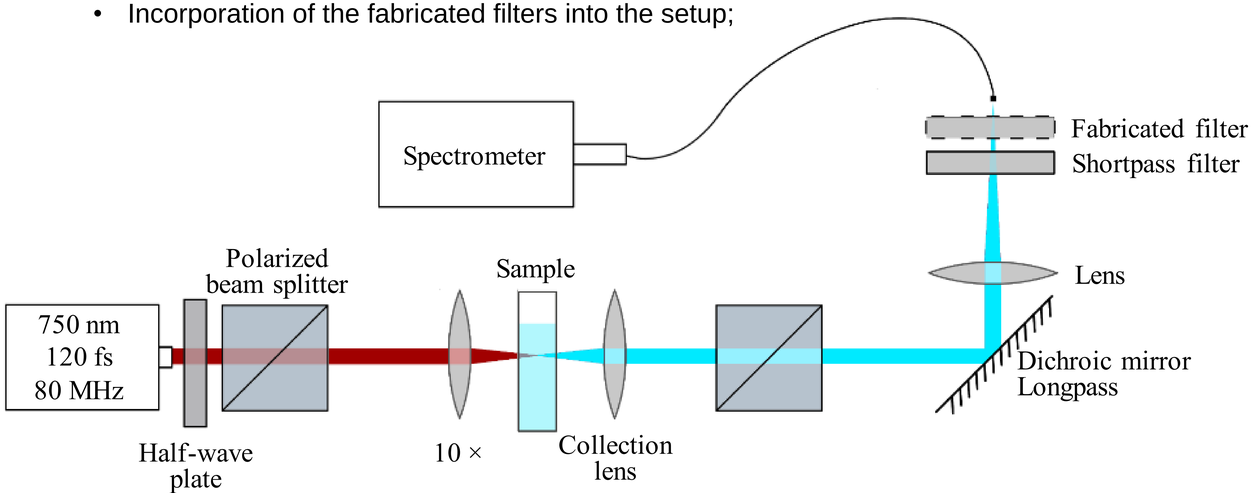
- **Objective:**
  - Explore one-photon fluorescence **excitation and emission peaks** of NADH and FAD;
- **Results:**



- **Conclusion:**
  - Two-photon **excitation** at **750 nm**;
  - Fabricated **optical filters** centered at **485 nm (NADH)** and **530 nm (FAD)**;

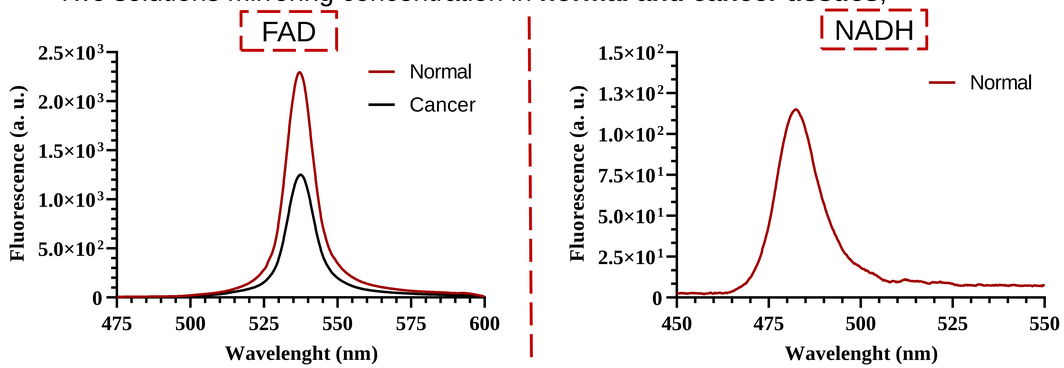
Techniques and Methods

- **Optical filters fabrication:**
  - Fabrication of **two optical filters** with a **Fabry-Perot** structure;
  - Suitable for NADH and FAD detection;
- **Experimental setup:**
  - Assembling a **setup for two-photon fluorescence** in liquid phantoms;
  - Incorporation of the fabricated filters into the setup;



Results and Conclusions

- **NADH phantom:**
  - One solution mirroring concentration in **normal tissue**;
- **FAD phantoms:**
  - Two solutions mirroring concentration in **normal and cancer tissues**;



- **Conclusions:** The experimental validation of this **MPM setup** shows its **potential** as a valuable tool for future research in **cancer monitoring and diagnosis**.
- **Acknowledgment**

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