

# PhD course: Light & Food

Optics, lasers, vibrational spectroscopy and chemometrics applied to food

February 23-27, 2015, Spectroscopy & Chemometrics, University of Copenhagen – Rolighedsvej 26, 1958 Frederiksberg C

Time	Monday (23. Feb.)	Tuesday (24. Feb.)	Wednesday (25. Feb)	Thursday (26. Feb.)	Friday (27. Feb.)
Theme	Optics and lasers	Supercontinuum lasers	Spectroscopy and food	Chemometrics / PAT	Hyperspectral imaging
9-12	Welcome Søren B. Engelsen Uni. of Copenhagen				
	Optics Søren R. Keiding Aarhus University	Existing applications of the supercontinuum lasers Lasse Leick NKT Photonics	Vibrational spectroscopy on food Søren B. Engelsen Uni. of Copenhagen	Basic chemometrics José M. A. Rubio / Frans van den Berg Uni. of Copenhagen	Hyperspectral imaging José M. A. Rubio Uni. of Copenhagen
Lunch			<b>BUS to FOSS</b>		
13-16	Laser principles Søren R. Keiding Aarhus University	Supercontinuum lasers Ole Bang Technical University of Denmark	The principles behind Milkoscan, Foodscan and Winescan Thomas Nikolajsen FOSS	Applied Chemometrics and PAT Frans van den Berg Uni. of Copenhagen	Chemometrics in hyperspectral imaging José M. A. Rubio Uni. of Copenhagen
			<b>BUS to FRB</b>		Dinner for the Light & Food members and presenters

Register before February 1<sup>st</sup> 2015 with Jeanette Venla Hansen - [jvh@food.ku.dk](mailto:jvh@food.ku.dk) - subject line: "Light & Food registration".

Venue: Meeting room at the fourth floor of the high grey building, mid section, room number R437.

The course is designed for 3 ETCS and the maximum of students attending the course is set to 25. Please ask for local hotel accommodation.



**Optics and lasers** (Søren R. Keiding – Aarhus University) The interaction between light and molecules provide us with a unique insight into the structure, dynamics and functionality of matter. Consequently, lasers and optical techniques have during the last half century evolved into myriads of spectroscopic techniques based on time- or frequency resolution and linear or non-linear interactions. We will cover basic laser principles, common laser types, and optical and spectroscopic techniques.



**Super-continuum lasers** (Ole Bang – Technical University of Denmark, Lasse Leick - NKT Photonics) Supercontinuum sources have the spectral width of a lamp and the beam quality of a laser. The supercontinuum spectrum is determined by fundamental nonlinear physical processes and fiber design. Due to the high flexibility of the laser design they are currently capturing market shares in different imaging applications including non-destructive testing and hyperspectral imaging.



**Vibrational spectroscopy and food** (Søren B. Engelsen – University of Copenhagen, Thomas Nikolajsen - Foss) A true paradigm shift has occurred in the food industry where engineers are now exploring their processes using soft models and spectroscopic sensors to complement traditional hard models and univariate measurements. Vibrational spectroscopy has been the key technology in this development. The basics of vibrational spectroscopy applied to food will be discussed.



**Chemometrics** (José M.A. Rubio – University of Copenhagen, Frans van den Berg – University of Copenhagen) The term 'chemometrics' was coined by Svante Wold in 1971, and the ICS's definition of chemometrics: "Chemometrics is the science of relating measurements made on a chemical system or process to the state of the system via application of mathematical or statistical methods." Chemometrics tries to build a bridge between the methods and their applications in chemistry.

**Process Analytical Technology / PAT** (Frans van den Berg – University of Copenhagen) The FDA considers PAT to be a system for designing, analyzing, and controlling manufacturing through timely measurements (i.e., during processing) of critical quality and performance attributes of raw and in-process materials and processes, with the goal of ensuring final product quality.

**Hyperspectral imaging** (José M.A. Rubio – University of Copenhagen) Hyperspectral Imaging of food is a rapid growing research area primarily due to current technology developments in near infrared imaging technology. Hyperspectral Imaging in combination with new multivariate imaging techniques can be used in industry for rapid quality and authenticity control and in Process Analytical Technology.

Course responsible: Søren Balling Engelsen, Spectroscopy & Chemometrics, FOOD.KU, [se@food.ku.dk](mailto:se@food.ku.dk)