Board of examiners

Prof. Joan Ferré
Department of Analytical Chemistry and Organic Chemistry
Universitat Rovira i Virgili, Tarragona, Spain

Prof. Bart De Ketelaere
Faculty of Bioscience Engineering
KU Leuven

Dr. Joanna Fraczek
Department of Toxicology, Dermato-Cosmetology and Pharmacognosy
Vrije Universiteit Brussel

Prof. Ann Van Eeckhaut
Department of Pharmaceutical Chemistry and Drug Analysis
Vrije Universiteit Brussel

Prof. Bart Rombaut, chair
Department of Pharmaceutical Biotechnology and Molecular Biology
Vrije Universiteit Brussel

Prof. Yvan Vander Heyden, **promotor**
Department of Analytical Chemistry and Pharmaceutical Technology
Vrije Universiteit Brussel

Prof. Thomas De Beer, promotor
Department of Pharmaceutical Process Analytical Technology
Universiteit Gent

Geneeskunde & Farmacie

GF

PhD in Pharmaceutical Sciences
2012-2013

Public defence of

Sigrid PIETERS

To obtain the academic degree of
'**DOCTOR IN PHARMACEUTICAL SCIENCES**'

Near-infrared and Raman spectroscopy for the in-line monitoring of protein unfolding during freeze-drying processes

Promotors: Prof. Y. Vander Heyden & Prof. T. De Beer

Monday 9 September 2013
Auditorium **Brouwer**, 17:00
Faculty of Medicine and Pharmacy, Laarbeeklaan 103, 1090 Brussel

How to reach the campus Jette:
http://www.vub.ac.be/english/infoabout/campuses

Please confirm your presence to Sigrid.Pieters@vub.ac.be

Vrije Universiteit Brussel

Summary of the dissertation

One of the objectives of the FDA's Process Analytical Technology (PAT) initiative is to move the analysis of critical quality attributes (CQA's) from the laboratory towards the manufacturing process environment. Because of their non-invasive nature, their ultra-fast analysis, and because of the fact that they can transfer light over meters through fiber optics, Near-infrared (NIR) and Raman spectroscopy have become major players, even the prototype, in many PAT applications. In this doctoral dissertation their potential has been investigated for a novel application: the in-line and real-time monitoring of protein unfolding during freeze-drying processes.

Based on the interaction of electromagnetic radiation with sample molecules, characteristic chemical and physical information about the sample, visualized as a spectrum, can be obtained. A first objective was to recognize the useful spectral information, i.e. that being correlated to the protein's conformational status. To allow using this spectral information for evaluating future samples (e.g. from novel batches or different formulations), or to perform in-line analysis during the freeze-drying process, the influences of spectral interferences were investigated. Strategies for dealing with these uninformative systematic spectral effects were developed in order to increase the robustness of the spectroscopic methods and to allow in-line monitoring during the freeze-drying process.

Curriculum Vitae

Sigrid Pieters was born on December 19th, 1979 in Aalst, Belgium. In 2003 she graduated as a Pharmacist at the Vrije Universiteit Brussel, and hereafter continued working in private pharmacies. In 2008 she obtained a Master after Master degree in Industrial Pharmaceutical Sciences (interuniversity). She performed her internship at the Pfizer manufacturing plant in Puurs, Belgium, where she obtained know-how on sterile drug product manufacturing. In December 2008 she started working as a pre-doctoral researcher at the department of Analytical Chemistry and Pharmaceutical Technology (FABI), under the supervision of Prof. Y. Vander Heyden. She started performing research in chemometrics in separation science, and afterwards she worked on her PhD dissertation, which was a co-operation between the VUB and the UGent (supervised by Prof. T. De Beer). For this work she obtained a scholarship from the Research Foundation – Flanders (FWO). In 2012, she had a research stay at Irstea in Montpellier, France. Under the supervision of Dr. J.M. Roger she obtained practical experience in using orthogonal projections for making multivariate calibration models more robust.

The results of her research work were published in several international peer-reviewed journals and presented as oral and poster communications at national and international conferences. She also co-promoted 4 master thesis students.