“CAS- Biocatalysis” - A Novel Postgraduate Teaching Concept to promote the Transfer of Academic Knowledge from Investigative to Industrial Scale

Katrin Hecht (ZHAW, Wädenswil)

Project Summary

Biocatalysis developed into one of the key technologies of the 21st century. Applying enzymes (biocatalysts) either in isolated form, as a cell extract or in form of a whole cell biocatalyst to replace or supplement reactions in organic chemistry has the potential to make chemical synthesis more efficient, environmentally friendly, sustainable and potentially more cost-effective. In addition waste material like biomass can be pretreated by biocatalysts to be further used to produce energy or biologically active substances. A plethora of scientific publications show that this is an active field of research. Over the years academia elaborated tools and provided proof of concept studies. Enzymes fitting a certain purpose, working under desired conditions and catalyzing even un-natural reactions can be developed. The potential of the technique is enormous; nevertheless industry application is still limited to few though impressive industrial applications, many related to the synthesis of drugs.

The competence center of biocatalysis (CCBIO) brings together academic and industrial partners within research projects to jointly develop biocatalytic processes for industrial application. Within this proposal (CAS – Biocatalysis) we will go one step further and supplement R&D efforts with a teaching concept. Know-how in biology, chemistry, bioinformatics, process engineering as well as in law and economics is needed to decide whether replacing/ supplementing a well-established organic chemistry process by a new biocatalytic concept is feasible. Students in life sciences have a basic understanding in biocatalysis at the end of their studies, but a program that covers all the aspects involved in setting up a biocatalytic process at industrial scale is missing in Switzerland.

The postgraduate Certificate of Advanced Studies course “CAS Biocatalysis” to be developed within this project will close the described gap. Within this proposal three modules will be developed:

- Basic biocatalysis and examples of industrial application (theory and experiments)
- Design of biocatalysts and evaluation of performance (theory and experiments)
- Legal/ economic aspects of biocatalytic processes (theory and case study)

Theoretical information will be provided in form of lectures as well as for self-study. Experimental work in the laboratory will give hands-on experience dealing with biocatalytic processes. The program will be open to university graduates in related fields and employees with a long-term practical experience in related fields (submission after evaluation). The modules may be booked as single classes (continuing education course). For the Certificate of Advanced Studies (12 ECTS) all three modules need to be completed and a written report has to be written.

Within this project we intend to achieve the following

- Explore industrial needs for continuing education in biocatalysis and design the content of the “CAS – Biocatalysis” accordingly
- Contact lecturers and potential guest lecturers
- Develop experiments for practical teaching
- Announce CAS-Biocatalysis

The initial CAS will be based on competences available at the ZHAW; further extension of the concept is planned by expansion of the module palette by involving other universities with experience in up-scaling, down-scaling or analytical methods. The final goal is to cover all aspects of the whole value-chain from gene to final product.