Tenure track position in Carbohydrate Biochemical Engineering
ENTE, Engineering and Technology institute Groningen

Discipline: Biochemistry/biotechnology
Level: tenure track assistant professor
Fte: 1.0

1. Scientific discipline
Biochemical engineering deals with the use of biological systems, in particular enzymes and microorganisms, or parts of it to convert (renewable) feedstocks to functional products and the design of related industrial processes. The new tenure-track assistant professor will focus on (chemo)enzymatic and microbiological processes for converting carbohydrate-rich fractions from agricultural/aquatic plant biomass to food ingredients, biofuels, and biochemical building blocks.

2. Vacancy
This vacancy concerns a tenure-track assistant professor (UD) position, according to the Faculty’s career policy “Career Paths in Science, edition 3”. The position will be embedded within the research group Aquatic Biotechnology and Bioproduct Engineering, Engineering and Technology institute Groningen (ENTE) of the Faculty of Mathematics and Natural Sciences. This position is part of the investment agenda Agro/Food of the Executive Board of the University (FB reference: EMK/gl/15/00979).

3. Selection Committee
Prof. Dr. Ir. J.M.A. Scherpen (director ENTE, chair)
Prof. Dr. M.J.E.C. van der Maarel (ENTE)
Prof. Dr. L. Dijkhuizen (scientific director CCC, GBB)
Prof. Dr. H.J. Heeres (ENTE)
Prof. Dr. F. Picchioni (ENTE, adjunct director Master IEM and CE)
Prof. Dr. R. Boom (WUR)
Student of IEM

Prof. Dr. G.J.W. Euverink (ENTE), advice
Dhr. H. Haagsma (HR), advice
4. Research area
Our society is gradually changing from using fossil, non-renewable resources to a more sustainable, bio-based economy to produce fuels, chemicals and chemicals-based consumer goods. Fossil hydrocarbons will be replaced more and more by biomass and products derived from it. Novel bio-refining and bio-conversion concepts are presently explored to optimize the extraction of valuable performance materials, preferably such that the production does not interfere with the food-chain. Energy carriers such as bio-hydrogen, bio-based chemicals, and bio-performance materials (biopolymers) obtained by classic chemical, microbiological and enzymatic routes are seen as important products. These are expected to deliver substitutes for existing transportation fuels and precursors for products that now are based on bulk-chemicals obtained from hydrocarbon resources. Most of the biotechnological pathways to these products are still inefficient due to low conversion rates (i.e., low temperatures using water as the reaction medium) and low yields (i.e., complex reaction products).
Biochemical engineering addresses several of these challenges by combining biological, chemical and engineering science to develop (large-scale) production processes using biological systems such as enzymes or microbial cells. The new tenure-track assistant professor will focus on (chemo)enzymatic processes for converting carbohydrate-rich fractions from agricultural/aquatic plant biomass to food ingredients, biofuels, and biochemical building blocks.

5. Research group and institute
ENTEG at the FMNS has a proven focus and strength in chemo and bio-catalytic biomass conversions and the development of biorefinery concepts for a wide range of biomass sources. These activities are currently expanded by two recently appointed tenure track assistant professor positions within ENTEG focussing on Green Chemistry and Technology.
The current position will focus on studies towards the development of novel enzymatic conversion processes to upgrade carbohydrate-rich fractions of plant biomass. The aim is to enhance research cooperation at the interface between chemical engineering, biotechnology and (bio)catalysis and as such the position will greatly strengthen the Groningen research program in biotechnology and sustainable chemistry and technology.

6. Local and (inter)national position
(Chemo) enzymatic conversion of carbohydrate-rich fractions of plant biomass is a rapidly growing area of interest, aiming at the production of bio-fuels and biochemicals. These topics are extensively studied by the US Department of Energy (DOE) and the National Renewable Energy Laboratory of Colorado (USA), various chemical companies and enzyme suppliers. The first pilot plants are currently being constructed. In Europe and, in particular, in France (regional initiatives), Italy and Denmark (DTU) some projects have been initiated but both large-scale biomass conversion and the production of valuable constituents remains in its infancy. Economic and technical barriers still need to be overcome and close cooperation between agricultural, biological and chemical engineering disciplines is seen a prerequisite before the large-scale use of biomass as feedstock for new products can become a large-scale commercial reality.
The food chemistry department (Prof. Gruppen en Prof. Schols) and the food process engineering department (Prof. Boom) of the Wageningen University are leading academic groups in the research area of the analysis of carbohydrates, in combination with the enzymatic conversion of carbohydrates and carbohydrate rich fractions. More applied research on carbohydrate conversion for new materials, food ingredients or biochemical is done at Food and Biobased Research of the Wageningen University and Research Center, at TNO location Zeist and at the companies DSM (Delft) and DuPont Bioscience (Leiden).
7. Expected contributions to research
The candidate will establish an internationally leading research program on biochemical engineering with emphasis on carbohydrates of agricultural/aquatic plant biomass. Challenging fundamental and applied research topics may be found in areas of “green and sustainable” products. The research will have to focus on exploring novel enzymatic conversion processes of carbohydrates extracted from aquatic/plant biomass by combining studying natural variation of carbohydrate-active enzymes, structure-function relationships of carbohydrate-active enzymes, with investigating the relationship between reaction conditions and functional properties on a molecular level (detailed structural insights) as well as micro/macroscopic level (e.g. rheology, digestibility) of the modified carbohydrates. To further ensure the successful development of the discipline it is expected that the candidate will establish joint research and development projects with the existing product engineering discipline in ENTEG, the metabolic engineering disciplines in the Groningen Biotechnology and Biochemistry institute (GBB), and chemistry groups of the Stratingh Institute. In addition, collaboration with (inter)national companies and in private-public research initiatives such as the Carbohydrate Competence Center is envisaged.

8. Expected contribution to teaching
The candidate will be involved in the teaching activities and curriculum development of Chemical Engineering and Industrial Engineering and Management (Ba, Ma and PhD levels) within the FMNS, examples being Biological Systems (BSc), (Bio)process technology practical (BSc) and Applied Biocatalysis (MSc). This requires excellent educational skills and a thorough understanding of the fundamentals of (bio)chemistry, bio-processing and bio-catalysis. Furthermore, the candidate is expected to supervise BSc and MSc thesis projects of the above two mentioned curricula.

9. Expected contribution to the organization
The successful candidate is expected to contribute in an active manner to the management and organizational tasks in the ENTEG institute, the Undergraduate School of Sciences and the Graduate School of Science, the Carbohydrate Competence Center and to participate in relevant national and international organizations.