

PhD position on the Photochemistry and Scale-up of Chemical-free Advanced Oxidation Processes by Vacuum UV Light for Water Treatment

Wetsus offers an exciting PhD opportunity for a dynamic personality, at the interface of high quality scientific research and cutting-edge technology development within its internationally recognized PhD programme.

The objective of the PhD project is to develop and validate new reactor concepts for photochemical water treatment that make use of vacuum UV radiation at 185 nm provided by low pressure mercury lamps besides the emission line at 254nm. The PhD candidate will design a new reactor modifying geometry, flow patterns and reagents. Experimentation will analyse the suitability of the rich photochemistry provided by vacuum UV irradiation to eliminate anthropogenic micropollutants in the presence of organic and inorganic constituents of drinking water and secondary effluent. The PhD candidate will specifically verify that the risk for generating secondary water quality hazards, e.g. unwanted byproducts, is not increased compared to the current AOPs. Verification and data analysis as well as design of new reactors will be supported by advanced numerical modelling techniques including chemical models, flow models (Computational Fluid Dynamics), and irradiation models, which will in fact constitute a main tool used by the PhD candidate. The PhD project thus entails two major parts: photochemical experiments and numerical modelling. The PhD candidate should have demonstrated expertise in at least one of these fields and preferably both.

The PhD project will benefit from the extensive collaboration already taking place among the various institutions involved in this theme. As such, the Ph.D. candidate selected for this project will be requested to travel in various geographies where some sponsoring institutions are headquartered (Spain, Canada and UK, beside Netherlands) and spend some periods of this doctorate in the form of internships in their premises.

The candidate will conduct the PhD in a dynamic environment within the Wetsus Priority Compounds Research Theme under the supervision of promoter and co-promoter(s). Dr Wolfgang Gernjak (Catalan Institute for Water Research, Spain) will be the principal promoter and advise the candidate on water quality aspects. Dr Bas Wols will be responsible for the day-to-day supervision at Wetsus and Dr. Domenico Santoro will contribute with modelling expertise to the PhD project. The PhD will be carried out in close collaboration with the industry members of the Wetsus Research Theme, most notably Trojan Technologies, PWN Technologies and Anglian Water. Wetsus provides further opportunities for complementary training within its PhD programme, e.g. on required technical skills, but also so-called soft skills.

Recommended introductory reading

Zoschke, K., H. Börnick and E. Worch (2014). "Vacuum-UV radiation at 185 nm in water treatment – A review." *Water Research* 52: 131-145.

Bagheri, M. and M. Mohseni (2015). "Impact of hydrodynamics on pollutant degradation and energy efficiency of VUV/UV and H₂O₂/UV oxidation processes." *Journal of Environmental Management* 164: 114-120.



Location, duration and salary

The PhD candidate will be an employee of Wetsus and hence conduct the majority of his/her work in Leeuwarden (www.wetsus.nl, The Netherlands). The candidate will also spend periods of time at the Catalan Institute for Water Research (www.icra.cat, Spain) and likely spend time at the industry partners participating in the PhD (Trojan UV in Canada and PWN in the Netherlands). The project period is 4 years.

Salary and working conditions are according to the collective labor agreement of the Cooperative Association of Dutch Universities (VSNU) for PhD students. Per 1-1-2017 the salary for a PhD student as determined by the collective labor agreement are (in Euros before tax per year): €30.674 (year 1), €35.728 (year 2), €37.408 (year 3) and €39.214 (year 4). PhD students are appointed by one of the cooperating universities but research is conducted at the Wetsus laboratory in Leeuwarden.

Selection criteria

- The candidate holds a Master Degree in a relevant discipline (see criteria below) or will receive this before the appointment date. Preferably a Master Degree of a University of Technology in Europe, North America, Canada, Australia or New Zealand. The candidate doesn't hold a previous PhD degree
- Proficiency in English, the main working language
- Demonstrated ability to work and communicate well in teams
- Strong knowledge in at least one of the following areas (ideally both):
 - AOPs and/or photochemistry
 - Numerical modeling of AOP (e.g. reaction kinetics, irradiation models, CFD models)
- Familiarity and sufficient knowledge drinking and reclaimed water treatment is desirable
- Ability to perform water quality experiments and technology assessment at laboratory and pilot scale is highly desirable
- Other qualifications that the candidate considers relevant

Application and Selection Procedure

Send you application to phdpositions@wetsus.eu before **22 February 2017**. The selection process will take place in three rounds:

1. Selection based on the required application documents (after submission deadline has passed).
2. An interview by means of a video call on **10 March 2017** (selected candidates will be notified the week before).
3. Final selection during a recruitment challenge on **20 March 2017** in The Netherlands. The recruitment challenge serves as the final assessment of the suitability of the candidate. During the challenge the candidate will be asked to present previous research, e.g. MSc thesis and to review a scientific article focusing on business and society awareness. Travel and accommodation expenses for attending the recruitment challenge will be covered by Wetsus.



Documents required for application:

- Motivation letter
- CV including education, grades, previous projects and publications (if any)
- Copy of Master diploma or letter of university that Master diploma will be obtained soon
- List of references that can be contacted upon request
- The candidate may decide to facilitate the assessment process and provide a written statement on how he/she thinks addresses the selection criteria.

Administrative contact

Dr Jan Post (jan.post@wetsus.nl), Coordinator of the Priority Compounds Research Theme at Wetsus.

