

Faculty of Science and Engineering

Profile report:

Rheology of hybrid (and supramolecular) materials - Rheologie van hybride (en supramoleculaire) materialen

Discipline: Mechanical Engineering, product technology, rheology, hybrid materials
Level: Assistant Professor (tenure track)
Fte: 1.0

1. Scientific discipline

Hybrid materials such as composites are commercially used in many applications. New hybrid materials have been developed with exciting applications in future circular economies like self-healing materials and thermally reversible networks. However, a better understanding on all length scales (micro, meso, macro) is required to improve existing products and to design challenging new high-tech products and to tailor product properties. In this respect, rheology research plays a major role and a better understanding of rheological behaviour and the relation with surface and interface properties in hybrid materials are highly relevant. In view of this, research on such systems constitutes a cornerstone in the general discipline of Product Technology and Polymer Science as it allows defining design rules at both the processing and product application phases.

2. Vacancy

This position is opened by the board of the Faculty of Science and Engineering (PT/gl/20/00059) in the framework of the sector plans and will be embedded in the Engineering and Technology Institute Groningen (ENTEG), basic unit Product Technology. The position falls within the framework of 'Career Paths in Science 4' ('Bèta's in Banen 4'). Please see [link for criteria and conditions](#).

3. Selection Committee (very tentative list, people must be asked)

- Prof. dr. ir. H.J. Heeres, professor Green Chemical Engineering Technology, scientific director ENTEG (chair)
- Prof. dr. ir. J. Scherpen, professor Discrete Technology and Production Automation, ENTEG
- Prof. dr. F. Picchioni, professor Product Technology, ENTEG, education director ENTEG
- Prof. dr. K.U. Loos, professor Macromolecular Chemistry & New Polymeric Materials, Zernike institute
- Prof. dr. M.M. G. Kamperman, professor Polymer Science, Zernike institute
- Prof. dr. A. Gotsis, Technical University of Crete, Greece
- To be announced (Student member)

Advisors:

- Mr. H. Haagsma, HR advice
- Dr. K.E. Voskamp, scientific coordinator ENTEG

4. Research area

For the design of novel and improved hybrid systems (including colloids, which are highly relevant for the development of composites and supramolecular materials) and to tailor mechanical and other properties, a good understanding of structural property-relations is crucial. Insight into the structure-property relations of such systems can be obtained by combined rheology and microscopy studies, and ideally in a joint effort. This would allow the conceptual coupling between the rheological behaviour and the microstructure of these materials. For instance, in the special case of nanocomposites and supramolecular materials (the particular focus of this position), this knowledge will pave the way towards the design of smart materials (e.g. rubber composites, self-healing materials) for a wide range of industrially relevant applications to meet current societal challenges (e.g. design for recycling). Additionally, the

proposed approach allows tackling one of the main challenges for these materials, namely the proper design of the interface between the matrix and dispersed phase in order to obtain the desired product properties.

5. Embedding: institute (and base unit)

The research institute ENTEG (www.rug.nl/enteg) is *the* engineering science and technology institute of the Faculty of Science and Engineering of the University of Groningen. ENTEG research is highly multidisciplinary in nature and focuses on fundamental and engineering research on the development of new and innovative processes and products. The research of ENTEG is conducted in three key research domains:

- the application of fundamental sciences to the design of new (sustainable) product and research in the area of product and production technology for (bio)chemical-based products,
- the development of quantitative and analytical theories and methodologies for model-based design and control of complex industrial processes and systems and,
- advanced production engineering aiming at improving the production processes of increasingly complex materials.

ENTEg staff strongly link to various education programmes, including the Chemical Engineering, Mechanical Engineering and Industrial Engineering and Management degree programmes.

The candidate is expected to set up his/her research line on the rheology of dispersed systems within the basic unit Product Technology (PT). Research within PT is focused on the design of new or improved chemical products. The current position has a clear focus on dispersed multiphase systems and as such, it is complementary to an already existing research line on the rheology of thermally reversible systems. Experience with supramolecular materials, for example to be used as the matrix for the hybrid systems, is desirable although not necessary.

Close research and teaching links also are expected with the other Chemical and Mechanical Engineering oriented units of ENTEG – such as the research units Green Chemical Reaction Engineering, Advanced Production Engineering, Computational Mechanical & Materials Engineering, and Discrete Technology & Production Automation. Also, close collaborations are foreseen with researchers of the Zernike Institute for Advanced Materials of our faculty (e.g. units Polymer Science, Macromolecular Chemistry & New Polymeric Materials, Micromechanics), where fundamental research is performed on advanced materials.

6. Local and (inter)national position

Engineering research at the University of Groningen is embedded in a broad scientific community. This position is created to strengthen the Faculty's profile in engineering. It connects fundamental research on advanced materials and fundamental polymer science (Zernike Institute) with that on the design of polymeric products for specific applications (ENTEg). Product design on micro, meso and macro-level is a unique feature of the research carried out in the basic unit Product Technology and is also the focus of the master program in chemical engineering. ENTEg has a variety of ongoing collaborations on the rheology of hybrid materials, among others with the technical University of Crete, although research there is mainly focused on pure polymeric systems (and less on hybrids). On a national and international level, several rheology-chairs can be recognized. However, they are most frequently embedded (for example at the Technical University of Eindhoven or Technical University of Delft) in a true mechanical engineering research environment. We believe that major breakthroughs considering the development of novel hybrid materials will only be possible when also considering chemical aspects on a molecular and meso- level, and this is a unique feature of the current position at the national level. Such a systematic link between rheological behaviour and chemical product design on various length scales also represents a novelty at international level.

7. Expected contribution to research

The successful candidate is expected to set-up his/her own research line in the area of rheology of hybrid (and supramolecular) materials. The research especially is expected to cross-fertilize the existing research lines within the ENTEg and the Zernike Institute. The research should

compete on a worldwide level and lead to publications in top-tier scientific publications. An essential part of the research activities comprises the supervision of Ph.D. students and post-doctoral researchers. The candidate is also expected to be successful in obtaining external funding for the research and to contribute to strengthening the international reputation of the group and the institute.

8. Expected contribution to teaching

The candidate mainly will teach at the master level in Mechanical Engineering and the bachelor and master programmes Chemical Engineering. He/she will play an active role in the development of these educational programmes. She/he is expected to participate in the teaching programme of specialized courses in relation to rheology of hybrid (and supramolecular) materials and other related topics. Furthermore, the candidate will be involved in supervising bachelor, master and PhD students.

9. Expected contribution to the organization

The candidate is expected to have an active interest and to provide a positive contribution to the management and organizational tasks of the institute. At the level of the FSE, the candidate will contribute to the organization of the faculty, for example by participating in working groups and committees, in the fields of teaching, research and management. The candidate will participate in relevant national and international organizations.

vacancy text

Tenure Track Assistant Professor Rheology of hybrid (and supramolecular) materials (1 fte)

Job description

We are looking for an Assistant Professor who can strengthen our position in the field of the rheology of hybrid (and supramolecular) materials with remarkable properties. A major objective is to develop structure-property relations by combined rheology and microscopy studies and to use this information to design and tailor the mechanical and other relevant properties of these materials. This knowledge will close the way towards the design of smart materials (e.g. rubber composites, self-healing materials) for a wide range of industrially relevant applications to meet current societal challenges (e.g. design for recycling).

As Assistant Professor you will:

- set up and develop your own research line and research group
- supervise PhD students
- acquire external funding
- promote the societal relevance of your research
- teach in and contribute to the development of the degree programme mechanical engineering and to the degree programmes chemical engineering
- contribute to the organization of the faculty, for example by participating in working groups and committees, in the domains of teaching, research and management

At the stage of Assistant Professor 60% of your time is for research, 30% for teaching activities and 10% for organizational tasks.

Qualifications

We encourage you to apply if you have:

- a PhD degree in mechanical- or chemical engineering or a related field; experience with polymeric products and multiphasic systems is highly desirable;
- at least two years of postdoctoral experience outside of the Netherlands, preferably in a different country than where you received your PhD, and a relevant international network
- excellent research qualities, as shown by a publication record in international peer-reviewed journals and proceedings of renowned conferences
- a good track record in teaching, appropriate to your career stage
- demonstrable organizational competences
- cross-cultural sensitivity
- good command of spoken and written English

And you are:

- a team player with good communication skills
- able to acquire substantial research grants from external sources
- willing to obtain a University Teaching Qualification (Dutch: BKO) within three years
- able to speak the Dutch language or motivated to speak it within five years.

Organization

The University of Groningen is a research university with a global outlook, deeply rooted in Groningen, City of Talent. Quality has been our top priority for over four hundred years, and with success: the University is currently in or around the top 100 on several influential ranking lists.

The Faculty of Science and Engineering (FSE) is the largest faculty within the University. We offer first-rate education and research in a wide range of science and engineering disciplines, from classical disciplines such as mathematics, astronomy and mechanical engineering, to interdisciplinary fields such as artificial intelligence, pharmacy and nanoscience. Our community has an open and informal character with students and staff from around the world.

The position we offer will be embedded in the Engineering and Technology institute Groningen (ENTEG). ENTEG research focuses on fundamental and engineering research on the development of new and innovative processes and products for a wide range of product sectors.

Conditions of employment

We offer you a full-time position as Assistant Professor in our faculty's tenure track system *Career Paths in Science* and:

- a salary, depending on qualifications and work experience, from € 3.746 up to a maximum of € 5.826 gross per month (scale 11 or 12 CAO Dutch Universities, depending on your career stage) for a full-time position
- holiday allowance and end-of-year bonus of respectively 8% and 8.3% of your yearly salary;
- a pension scheme
- maternity and parental leave
- the possibility to work part-time (0,9 fte or 0,8 fte)
- a mentor program and a broad range of opportunities for personal development
- dual career support for partners of new faculty members moving to Groningen

Consider our website for more information about the working conditions at the University of Groningen: <https://www.rug.nl/about-us/work-with-us/that-is-why/>

As Assistant Professor you will enter a tenure track that, if followed successfully, will lead to a Full Professorship in approximately 10 years. In case of a full-time contract, you will initially be appointed for 7 years and your performance will be assessed after 5 years. This moment may be extended with at most one year in case of a life event (*e.g.* prolonged illness or maternity leave). If your assessment is positive, you will get a tenured appointment as an Associate Professor. After another 4 to 7 years you will be assessed for promotion to the position of Full Professor. Please consider *Career Paths in Science* for a complete description of our tenure track system as well as the criteria for promotion:

<https://www.rug.nl/fse/organization/vacatures/vacatures/career-paths-in-science-edition-4?lang=en>.

Application

We invite you to submit a complete application including:

- a cover letter in which you describe your motivation and qualifications for the position
- a curriculum vitae, including a list of your publications and a list with names of references
- a list of five self-selected 'best papers'
- a statement of your teaching goals and experience
- a description of your scientific interest and plans

Please send your application by clicking on "Apply" below the advertisement on the website of the university. The deadline for applications for this position is 9am CET on [date].

We aim to schedule selection interviews in the first two weeks of February 2021.

The University of Groningen is an equal opportunity employer and we value diversity at our organization. We do not discriminate on the basis of ethnicity, religion, national origin, gender, sexual orientation, age, marital status or disability status. Our selection procedure follows the guidelines of the NVP Recruitment Code and the European Code of Conduct for recruitment of researchers from the European Commission.

Information

For information about the position you can contact:

- Prof.dr. Francesco Picchioni, professor and chair Product Technology, +31 50 36 34333, f.pichioni@rug.nl
- Prof.dr.ir. Hero Heeres, scientific director ENTEG, +31 50 36 34174, h.j.heeres@rug.nl

Please do not use these e-mail address(es) for applications.

Additional information

- Profile report in which the position is described in more detail: <https://www.rug.nl/fse/organization/vacatures/vacatures/structuurrapporten/>
- More information about the research institute: www.rug.nl/enteg
- More information about the employment conditions of the University of Groningen: <https://www.rug.nl/about-us/work-with-us/that-is-why/>
- Career Paths in Science: <https://www.rug.nl/fse/organization/vacatures/vacatures/career-paths-in-science-edition-4>