CAS-FRAUNHOFER JOINT DOCTORAL PROGRAMM: RESEARCH TOPICS

The Fraunhofer-Gesellschaft

The Fraunhofer-Gesellschaft, headquartered in Germany, is the world's leading applied research organization. With its focus on developing key technologies that are vital for the future and enabling the commercial exploitation of this work by business and industry, Fraunhofer plays a central role in the innovation process. As a pioneer and catalyst for groundbreaking developments and scientific excellence, Fraunhofer helps shape society now and in the future. Founded in 1949, the Fraunhofer-Gesellschaft currently operates 75 institutes and research institutions throughout Germany. The majority of the organization's 29,000 employees are qualified scientists and engineers, who work with an annual research budget of 2.8 billion euros. Of this sum, 2.4 billion euros are generated through contract research.

Fraunhofer-CAS joint training program for doctoral students

The joint training program for doctoral students has been running since 2008. So far over 100 CAS –PhD-students have been invited to conduct research for their PhD-theses at one of the Fraunhofer Institutes. The aim of the joint doctoral program is to promote the scientific exchange between Germany and China.

Initially a research stay with a duration of 12 months will be approved. If the hosting Fraunhofer Institute as well as the CAS home institution agree it may be prolonged for 6 months after the first year. Students can apply for different institutes depending on their research fields.

The Fraunhofer Institutes had the opportunity to hand in research topics which they would like to pursue in cooperation with CAS PhD-students. Kindly refer to pages 2-12 to learn more.

As unsolicited applications will be possible in the upcoming round of selection as well you should not feel concerned if the open positions do not match your research area. Please do not hesitate to hand in unsolicited applications for the institute of your choice. Feel free to contact the Fraunhofer Office Beijing as well as the program management in the Fraunhofer Headquarters in case you require assistance in finding a suitable Fraunhofer Institute to conduct your PhD-project.

RESEARCH TOPICS

1. FRAUNHOFER INSTITUTE FOR MANUFACTURING TECHNOLOGY AND ADVANCED MATERIALS IFAM

Founded in 1968 and integrated into the Fraunhofer-Gesellschaft in 1974, the Fraunhofer IFAM is one of the most important research institutions in Europe for adhesive bonding technology, surfaces, shaping and functional materials. At our institute's five locations – Bremen, Dresden, Stade, Wolfsburg and Braunschweig as well as at the Test Center for Maritime Technologies on Helgoland – we put our central principles into practice: scientific excellence, a focus on the application of technology, measurable utility for customers and ensuring the highest quality.

Our round about 700 employees, working in 20 departments and working groups, combine their broad technological and scientific knowledge and expertise into core competencies: Metallic Materials; Polymeric Materials; Surface Technology; Adhesive Bonding; Shaping and Functionalization; Electromobility; and Automation and Digitalization. These core competencies - both individually and in combination with each other – are not only the basis of our strong position in the research market but also of future-forward developments that will be useful for society.

Most of the products, processes, and technologies we develop are for sectors where sustainability is particularly important, namely for the aviation industry, automotive sector, energy technologies, medical technology and life sciences and maritime technologies . The solutions developed at Fraunhofer IFAM are, however, also used in various other branches of industry including machinery and plant construction, electronics and electrical engineering, shipbuilding, rail vehicle manufacture, the packaging industry, and the construction sector.

Topic: Carbon dioxide as building block for polymers and reactive resins

One of the most important bridging focuses between science and industry is to put economic and environmental needs into balance. Contributions to this are e.g. sustainability and circular economy.[1] Presently humans emit high amounts of carbon dioxide and fossil carbon sources are limited. Therefore, it is important to learn how to utilize the carbon dioxide from the air as carbon source. It is the aim of the project to develop and improve reactions allowing the synthesis of polymers and reactive resins (e.g., for adhesives or fiber reinforced plastics) with carbon dioxide as carbon source.

This might include, the activation and transference of CO_2 to substrates in the absence of transition metals while utilizing mild conditions could make a difference.[2] One specific application field of high interest for the insertion of CO_2 and derivatives are polyurethanes and polyureas.[3] The synthesis of cyclic carbonates and their further use is a core issue of the topic. Additional own ideas of the potential candidate are highly desired, and the person must be able and willing to develop the initial ideas further.

The potential candidate must have the following qualification:

- Highly experienced in preparative chemistry and skilled in practical lab work

In addition, advanced experience in the following fields is desired:

- Organic and main group synthetic chemistry (ideal group 13 and 15 chemistry)
- Air sensitive synthetic techniques (Schlenk techniques, AR-/N_2-atmosphere)
- NMR, GC-MS and IR measurements and interpretation
- Polymer chemistry
- Homogeneous catalysis

Soft skills:

- Team player
- Self-critical scientist
- Creative chemist
- Intercultural competence

Fraunhofer

Contact

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2. FRAUNHOFER INSTITUTE FOR WIND ENERGY SYSTEMS IWES

About the institute

Wind energy is our primary focus. Our institute is home to more than 350 employees and students from over 30 countries pursuing careers in applied research and development in the field of wind energy use. The key aspect is the production of electricity and hydrogen. Our successful combination: an internationally unparalleled testing infrastructure and comprehensive methodological expertise in the reliability and validation of wind turbines and wind farms as well as the smart system integration of wind energy in future energy supply systems.

The group »Test and Method Development«

Our group »Test and Method Development«, which consists of 2 research associates and is part of the department »System Validation Mechanical Drive Train«, focuses on developing innovative and tailor- made solutions for the simulation and validation of drive trains and drive train components of wind turbines. A special focus of the group's activities is the implementation of complex and detailed simulation models, which are utilized to plan and to supplement real test setups in the sense of virtual testing. The competence demonstrated in numerous applications enables to efficiently plan, develop, and implement new types of test benches and test procedures. The team supports each other irrespective of the projects and backgrounds. A culture of open exchange and cooperation, even beyond the boundaries of the team, is particularly important to us.

Topic: Fem Modelling and simulation for bearing seat ring creep prediction

Modern wind turbine drivetrains are continuously optimized for minimum weight and cost, making use of both new materials such as nodular cast iron as well as lightweight design techniques, aiming for increasing power density in wind turbine power trains. One aspect of this trend with respect to the main bearing assembly of a wind turbine drivetrain is the risk of creeping bearing rings. Due to increased power density relatively larger loading as well as deformation of the leaner support structures occur, increasing the risk of the ring creeping phenomenon. [1]

For large baring seats such as wind turbine main bearings there are no standard procedures available to assess the risk of ring creep. Finite element simulations can be utilized to determine the creeping tendency a drive train setup, to eventually develop a robust methodology to predict the occurrence of ring creep.

The scope of the research project will be the development of a finite element model for the analysis of ring creep at large main bearing seats in wind turbine drive trains. The model shall be developed using the software Ansys Workbench.

Required Background

You have completed your diploma or master's degree in Mechanical Engineering or a similar field. You have already gained experience with detailed contact modelling in FEM and with FEM software, preferably Ansys? You have good knowledge of roller bearings and bearing modelling and simulation? If you are interested in wind energy and renewable energy engineering, we should definitely meet! A good command of English or German will make your day-to-day work easier.

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Fraunhofer

Homepage:

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[1] Kirsch, J., Kyling, H. Optimized cast components in the drive train of wind turbines and inner ring creep in the main bearing seat. *Forsch Ingenieurwes* **85**, 199–210 (2021). https://doi.org/10.1007/s10010-021-00458-x

3. FRAUNHOFER INSTITUTE FOR SYSTEMS AND INNOVATION RESEARCH ISI

The Fraunhofer Institute for Systems and Innovation Research ISI is a globally recognized center of excellence for innovation research. Due to the different focuses of our seven competence centers, we work on central issues of innovation dynamics and system transformation in an interdisciplinary manner and from a holistic perspective. The institute offers unique possibilities for the application and development of new approaches in innovation research.

Fraunhofer ISI analyzes the origins and impacts of innovations. We research the short- and long-term developments of innovation processes and the impacts of new technologies and services on society. On this basis, we are able to provide our clients from industry, politics and science with recommendations for action and perspectives for key decisions. Our expertise is founded on our scientific competence as well as an interdisciplinary and systemic research approach.

We are happy to receive applications for the CAS-Fraunhofer scholarship program in the following areas of social sciences:

- Innovation economics, especially analyses of industrial transformations (e.g., Industry 4.0, digitalization, changing value and supply chains, ecological transformation)
- Innovation indicators, especially big data indicator developments or applications
- Innovation policy analysis, especially mission-oriented policies (e.g., Societal Grand Challenges)
- Dynamics and drivers of sustainability innovations and green economy (environmental innovations related to energy, circular economy)
- Design and evaluation of energy policies to reduce GHG (e.g., emissions trading)

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4. FRAUNHOFER INSTITUTE FOR PRODUCTION TECHNOLOGY IPT

a. Topic: Development of a Cross-Site Data Space for the industrial internet of Things (IIoT)

The constantly increasing degree of networking in production enables new ways of production organization and control. By using the latest technologies and software solutions, relevant production data can be recorded and used for holistic process analyses and control. However, the data generated by networking has so far been used almost exclusively to fulfill an individual task and not for the entire, cross-site process chain, as envisaged in the Industry 4.0 concept.

In order, to harness the potential of the data, a data space is to be established for the area of industrial production, based on the Industrial Data Space model. Production and research data can be shared between suppliers, production facilities and research institutions. This not only enables the use of data-driven services, but also the rapid construction of new production environments and their optimization.

In order, to make the data space usable externally, a data marketplace is to be implemented. The marketplace will enable sovereign trading and monetization of production, process and research data. Based on the Data Space, a platform will be developed that bundles and opens up the data potential of the Industry 4.0 ecosystem.

Take the next step of the digital transformation with us and research innovative concepts for connecting networked production systems to industrial data spaces and data marketplaces together with our highly motivated and interdisciplinary team.

Your tasks

- Development of a data space for cross-location networking of different production sites based on the Industrial Data Space model
- Implementing a data marketplace for trading and monetization production, process and research data
- Integrating of the data space and marketplace into the Fraunhofer Edge Cloud

Our requirements

- Successfully completed academic university degree in the field of computer science, computational engineering science (CES) or comparable
- Solid background knowledge of software architectures, network technology and cloud computing
- Experience with virtualization technologies such as Docker, Kubernetes or comparable
- Programming experience in C#, C++, Java, Python or comparable
- Strong communication skills and enjoyment of interdisciplinary teamwork
- An independent way of working as well as analytical skills
- Very good knowledge of the English language, both written and spoken

What you can expect from us

- Cooperation in a committed and collegial team
- Close cooperation with renowned industrial partners from a wide range of sectors
- Freedom to take on responsibility and implement your own ideas
- State-of-the-art machinery with edge cloud systems and a 5G infrastructure
- Excellent professional and personal development through a variety of internal training courses

We look forward to receiving your application.

Contact

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b. Development of an ultra-high resolution wavefront sensor for the application in a gravitational wave detector

At the Fraunhofer IPT we develop customized metrological systems for research and industrial applications. High-tech solutions for fundamental research as the newly developed gravitational wave detectors need cutting edge metrology systems to guarantee their functionality and precision. In your time at the Fraunhofer IPT you will develop an ultra-high precision wavefront sensor, for the integration into a gravitational wave detector. Within the detector the wavefront sensor is supposed to detect minimal deformations of mirrors which are essential components of the gravitational wave detector.

In order to develop such an ultra-high precision wavefront sensor, it will be mandatory to carry out in depth optical simulations regarding the planned sensor setup and the needed components. The results of the simulations will then be transferred into a lab-setup of the sensor.

Your tasks

- Development of an ultra-high resolution wavefront sensor
- Implementation of systematic optical simulation to determine the ideal setup of the sensor
- Realization of a lab-setup of the sensor prototype

Our requirements

- Successfully completed academic university degree in the field of physics, optics or comparable
- Solid background knowledge of optical simulations using OpticStudio (Zemax) or comparable
- Experience with optical lab-setups
- Strong communication skills and enjoyment of interdisciplinary teamwork
- An independent way of working as well as analytical skills
- Very good knowledge of the English language, both written and spoken

What you can expect from us

- Cooperation in a committed and collegial team
- Close cooperation with renowned industrial partners from a wide range of sectors
- Freedom to take on responsibility and implement your own ideas
- State-of-the-art machinery and optical laboratories
- Excellent professional and personal development through a variety of internal training courses

We look forward to receiving your application

Contact

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5. FRAUNHOFER INSTITUTE FOR PHOTONIC MICROSYSTEMS (IPMS)

Are you enthusiastic about new paradigm of computing or IC design? Do you want to invest your time in innovative research and developments, which will make a significant impact on scientific society? THEN JOIN US!

The Fraunhofer Institute for Photonic Microsystems (IPMS) works at the highest international levels for nanoelectronic, mechanical and optical components to support their integration into the tiniest "intelligent" elements and systems. Together with industry, service companies and the public sector, we develop innovative solutions to directly benefit both business and society. Our technologies are found in all relevant markets including information and communications, consumer electronics and the semiconductor industry, as well as the automotive and medical fields.

We have vacancy for multiple PhD positions in "CMOS Integrated RF & AI Nanoelectronic Technologies for IOT Components & Systems" group at Fraunhofer IPMS, Dresden, Germany. The positions will be supported in collaboration with the Chinese Academy of Sciences (CAS) and all appointments will be jointly decided upon with CAS. We offer multiple positions with varied and independent tasks in a research friendly environment. You will have a chance to work with cutting edge researchers in industry. We promote your path to personal development through regular employee appraisals and tailored training to enhance your individual qualifications.

Homepage:

http://www.ipms.fraunhofer.de

a. Topic: Associative Memory - towards ultrafast Genome Sequencing

You will be involved in the realization of an ultra-fast (>100x faster than currently available), very energy-efficient (consuming >70% less energy than current platforms), and cost-efficient (>100x cheaper than servers) platform for genome analysis by utilizing energy-efficient computation with associative memory cells (TCAM) such as ferroelectric field effect transistors (FeFET) implemented in an advanced node such as 28nm or 22nm FDSOI technology. With this genome sequencing platform, it will be possible to transform microbial sequencing, genome sequencing, and exome sequencing in clinical settings and in the field so to guide diagnosis and treatment in mobile genomics.

Although it is suggested that the successful candidate participates in one of the following development activities, we are also open to new ideas in the field of

- Neuromorphic circuit and system design
- Emerging memory devices for neuromorphic applications
- Algorithms for energy-efficient analysis
- RF and mm-wave IC design

What we expect from you

- Masters' Degree in Electrical Engineering, Physics, Microelectronics, Computational Engineering or similar.
- Knowledge of semiconductor device physics/ analog circuits/ digital circuits/ neural networks are preferred, not mandatory.
- Good knowledge in English language.

Have we piqued your interest? Then, apply with us! We look forward to meeting you.

Contact:

Dr. Thomas Kämpfe
E-Mail: thomas.kaempfe@ipms.fraunhofer.de

b. Topic: Integration of memory & in-memory computing devices into flexible substrates

You will be involved in the realization of a flexible integrated circuit platform for storage and analysis of data. The technology is forecasted to drastically reduce the required power consumption for localized data analysis and be more cost efficient due to a co-integration with high-volume thin-film technology processes. By this platform it will be possible to transform robotics feedback in a large range of applications due to co-integration with sensors detecting for example bending and stretching.

Although it is suggested that the successful candidate participates in one of the following development activities, we are also open to new ideas in the field of

- Neuromorphic circuit and system design
- Emerging memory devices for neuromorphic applications
- Algorithms for energy-efficient analysis
- RF and mm-wave IC design

What we expect from you

- Masters' Degree in Electrical Engineering, Physics, Microelectronics, Computational Engineering or similar.
- Knowledge of semiconductor device physics, memory technology, analog circuits, digital circuits, neural networks are preferred, not mandatory.
- Good knowledge in English language.

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E-Mail: thomas.kaempfe@ipms.fraunhofer.de

c. Topic: mmWAVE Computing - towards peta-operation per second (PetaOps) ASICs

You will be involved in the realization of a high-performance computing system enhancing the currently available compute performance by 1000x. The technology is forecasted to drastically reduce the required power consumption for localized data analysis as well as 6G network optimization. By supporting computation in the millimeter wavelength (mmWave) range above 30GHz extremely high data rate can be achieved in a unprecedentedly small area. You can be involved both in various fields covering device optimization towards mmWave requirements as well as RF/mmWave periphery design.

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- Neuromorphic circuit and system design
- Emerging memory devices for neuromorphic applications
- Algorithms for energy-efficient analysis
- RF and mm-wave IC design

What we expect from you

- Masters' Degree in Electrical Engineering, Physics, Microelectronics, Computational Engineering or similar.
- Knowledge of semiconductor device physics, memory technology, analog circuits, digital circuits, neural networks are preferred, not mandatory.
- Good knowledge in English language.

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d. Topic: Neural architecture search - Training of efficient edge AI/tiny ML solutions

You will be involved in the implementation of ultra-low power Edge AI/tiny ML solutions for various problems by neural architecture search. To accelerate the implementation of neural networks as well as decision trees in-memory computing is used based on ferroelectric field-effect transistors (FeFETs). This enables an increase in power efficiency by two to three orders of magnitude with respect to conventional hardware. By pareto-optimal training of the network additional gains can be achieved by reducing the memory requirement and energy consumption under preservation of accuracy limits to ensure functioning on edge application cases e.g. battery-driven time series data analysis of machine states, which can revolutionize condition monitoring in a wide field of applications.

Although it is suggested that the successful candidate participates in one of the following development activities, we are also open to new ideas in the field of

- Neuromorphic circuit and system design
- Emerging memory devices for neuromorphic applications
- Algorithms for energy-efficient analysis
- RF and mm-wave IC design

What we expect from you

- Masters' Degree in Electrical Engineering, Physics, Microelectronics, Computational Engineering or similar.
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e. Topic: D-Band link design for 6G applications

You will be involved in the design of efficient D-band links at a frequency of about 140 GHz, necessary as backhaul links in the upcoming 6G communication networks. By implementation into an FDSOI technology superb RF as well as logic properties can be combined which can drive very efficient pico- and femto-cells immersed in IoT devices as well as backhaul links supporting point-to-point as well as point-to-multipoint line of sight connections. Improvements in the circuit design of such systems can severally improve the power efficiency, directability of the formed beams and area of scaled systems.

Although it is suggested that the successful candidate participates in one of the following development activities, we are also open to new ideas in the field of

- Neuromorphic circuit and system design
- Emerging memory devices for neuromorphic applications
- Algorithms for energy-efficient analysis
- RF and mm-wave IC design

What we expect from you

- Masters' Degree in Electrical Engineering, Physics, Microelectronics, Computational Engineering or similar.
- Knowledge of semiconductor device physics, memory technology, analog circuits, digital circuits, neural networks are preferred, not mandatory.
- Good knowledge in English language.

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Homepage:

http://www.ipms.fraunhofer.de

6. Fraunhofer Institute for Microengineering and Microsystems IMM

a. TOPIC »BIOLOGICAL PROCEDURES FOR MICRO-ORGANISMS DETECTION IN INDUSTRIAL PRODUCTION«

IS MICROBIOLOGICAL ANALYSIS YOUR INTEREST? WE AT THE FRAUNHOFER-INSTITUT IMM OFFER YOU AN EXCITING OPPORTUNITY IN THE FIELD OF DIAGNOSTICS IMMEDIATELY

We, the Fraunhofer IMM in Mainz, research and develop in the fields of energy, chemistry and diagnostics. The focus is on hydrogen-based energy supply, sustainable chemistry and process analysis as well as medical and industrial diagnostics. With our development work, we make a significant contribution to the social challenges of »safe, clean and efficient energy«, »climate protection, environment and resource efficiency« and »health«.

Bacterial contamination in production processes can pose a risk to people, products and, in some cases, even systems. The tests that are common nowadays in central laboratories are time-consuming and not suitable for reacting immediately to dangers. In various industrial areas, so-called point-of-use devices (PoU) are urgently needed for the direct detection of microbial contamination. The polymerase chain reaction (PCR) is an excellent method for the detection of microorganisms through the amplification of specific DNA segments. A missing link in order to use PCR-based applications on site is besides automation and miniaturization of the work steps as well as the purification, lysis and DNA isolation in the sample preparation. And here is where you come in.

Objective of the doctorate

Even at a very low concentration, microorganisms can pose a risk. Your research is therefore to develop biological processes of sample preparation by taking into account the special requirements of microtechnology and microfluidics, in close cooperation with our scientific-technical team. Main challenge in this project: You will do the traditional laboratory methods of microorganism concentration, lysis, DNA purification and PCR seamlessly available in microfluidic systems. Recognize microorganism contaminations in various industrial (intermediate) products and media and quantify them.

What we expect of you:

- Successfully completed scientific university degree in the field of microbiology, molecular biology or bioinformatics, with a very good knowledge of PCR.
- Experience in the design of PCR primers / probes, flow cytometry, immunoassay, etc.
- In-depth knowledge of bacteria, fungi, yeast, viruses, etc.
- Good knowledge and experience in cell lysis methods
- Ideally, knowledge of microfluidics and reagent lyophilization
- Experience working in a research or development environment with an interdisciplinary team
- An independent working style, ability to work in a team and analytical thinking skills
- Fluent written and spoken English as well as excellent communication skills, basic knowledge of German is preferred
- Interest in experimental work and the desire to convert your own ideas into new technical solutions
- Work experience in industry is desirable
- Very good academic writing skills are preferred

What you can expect of us:

- An exciting and varied topic with a high level of practical relevance
- An interdisciplinary working environment and a wide range of internal production and measurement technologies
- Many years of experience in supervising students and doctoral candidates
- Support with scientific publications, e. B. Articles in trade journals
- Diverse interdisciplinary exchange with other students and doctoral candidates in our institute Personal scope for developing your own creative ideas

- Individual development through further qualification, e. B. through the Fraunhofer education program with seminars to support the doctorate, as well as through participation in trade fairs and conferences
- Open, results-oriented and cooperative working atmosphere

Contact

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b. TOPIC »MICROFLUIDIC METHODS FOR ON-SITE DETECTION OF MICRO-ORGANISMS IN INDUSTRIAL PRODUCTION«

IS MICROFLUIDIC TECHNOLOGY YOUR INTEREST? WE AT THE FRAUNHOFER-INSTITUT IMM OFFER YOU AN EXCITING OPPORTUNITY IN THE FIELD OF DIAGNOSTICS IMMEDIATELY

We, the Fraunhofer IMM in Mainz, research and develop in the fields of energy, chemistry and diagnostics. The focus is on hydrogen-based energy supply, sustainable chemistry and process analysis as well as medical and industrial diagnostics. With our development work, we make a significant contribution to the social challenges of »safe, clean and efficient energy«, »climate protection, environment and resource efficiency« and »health«.

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Objective of the doctorate

Even at a very low concentration, microorganisms can pose a risk. Your research is therefore to develop microfluidic methods that allow you to extract microorganisms from large sample volumes of industrial media to allow immediate PCR detection, in close cooperation with microbiologists and our scientific-technical team. Your main challenge: You work on the physical phenomena at the microscale creatively by taking into account the requirement that microsystems can later be mass produced.

What we expect of you:

- Successfully completed academic university degree in the field of physics, mechanical engineering or in chemical engineering with very good knowledge of microfluidics and microtechnology
- Good knowledge of the interactions of polymers (PC, PMMA, COP, COC) with liquids (wettability,
- Stability, fluid absorption, etc.) and basic knowledge of microbiology is an advantage
- Ideally, knowledge of the manufacture of polymers
- Good knowledge of C++, Python, Labview is preferred
- Experience working in a research or development environment with an interdisciplinary team
- An independent working style, ability to work in a team and analytical thinking skills
- Interest in experimental work and the desire to convert your own ideas into new technical solutions
- Fluent written and spoken English as well as excellent communication skills, basic knowledge of German is preferred
- Work experience in industry is desirable
- Very good academic writing skills are preferred

What you can expect of us:

- An exciting and varied topic with a high level of practical relevance
- An interdisciplinary working environment and a wide range of internal production and measurement technologies
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- Open, results-oriented and cooperative working atmosphere

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c. DOCTORAL CANDIDATE WITH THE RESEARCH TOPIC »MICROFLUIDIC METHODS FOR ON-SITE DETECTION OF MICRO-ORGANISMS IN INDUSTRIAL PRODUCTION«

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We, the Fraunhofer IMM in Mainz, research and develop in the fields of energy, chemistry and diagnostics. The focus is on hydrogen-based energy supply, sustainable chemistry and process analysis as well as medical and industrial diagnostics. With our development work, we make a significant contribution to the social challenges of »safe, clean and efficient energy«, »climate protection, environment and resource efficiency« and »health«.

Bacterial contamination in production processes can pose a risk to people, products and, in some cases, even systems. The tests that are common nowadays in central laboratories are time-consuming and not suitable for reacting immediately to dangers. In various industrial areas, so-called point-of-use devices (PoU) are urgently needed for the direct detection of microbial contamination. The polymerase chain reaction (PCR) is an excellent method for the detection of microorganisms through the amplification of specific DNA segments. The missing link in order to use PCR-based applications on site is the automation and miniaturization of lengthy and mainly manual sample preparation processes. And here is where you come in.

Objective of the doctorate

Even at a very low concentration, microorganisms can pose a risk. Your research is therefore to develop microfluidic methods that allow you to extract microorganisms from large sample volumes of industrial media to allow immediate PCR detection, in close cooperation with microbiologists and our scientific-technical team. Your main challenge: You work on the physical phenomena at the microscale creatively by taking into account the requirement that microsystems can later be mass produced.

What we expect of you:

- Successfully completed academic university degree in the field of physics, mechanical engineering or in chemical engineering with very good knowledge of microfluidics and microtechnology
- Good knowledge of the interactions of polymers (PC, PMMA, COP, COC) with liquids (wettability,
- Stability, fluid absorption, etc.) and basic knowledge of microbiology is an advantage
- Ideally, knowledge of the manufacture of polymers
- Good knowledge of C++, Python, Labview is preferred
- Experience working in a research or development environment with an interdisciplinary team
- An independent working style, ability to work in a team and analytical thinking skills
- Interest in experimental work and the desire to convert your own ideas into new technical solutions

- Fluent written and spoken English as well as excellent communication skills, basic knowledge of German is preferred
- Work experience in industry is desirable
- Very good academic writing skills are preferred

What you can expect of us:

- An exciting and varied topic with a high level of practical relevance
- An interdisciplinary working environment and a wide range of internal production and measurement technologies
- Many years of experience in supervising students and doctoral candidates
- Support with scientific publications, e. B. Articles in trade journals
- Diverse interdisciplinary exchange with other students and doctoral candidates in our institute
- Personal scope for developing your own creative ideas
- Individual development through further qualification, e. B. through the Fraunhofer education program with seminars to support the doctorate, as well as through participation in trade fairs and conferences
- Open, results-oriented and cooperative working atmosphere

Contact

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Homepage

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