

Biological responses to novel surface modifications of dental zirconia implants

Ref. BAP-2023-551

The PhD project will be performed in a unique interdisciplinary platform within the BIOMAT research group of the KU Leuven Department of Oral Health Sciences and the Surface and Interface Engineered Materials (SIEM) research group of the KU Leuven Department of Materials Engineering. Bridging dentistry and materials engineering, we will investigate the interplay between structural integrity, surface and functional properties, and biological behavior of biomedical ceramics, with the specific intention to develop new bioceramics for dental implants and restorations with prolonged clinical lifetime.

Project

Zirconia ceramics are the most promising materials for metal-free dental implants, because of their superior mechanical characteristics, excellent biocompatibility with low bacterial plaque affinity and natural root-like aesthetics. The long-term clinical success of dental implants largely depends on two major factors: osseointegration potential of the implant fixture and soft-tissue attachment to the abutment/restoration. The osseointegration potential of zirconia, however, is suboptimal, especially since high failure rates and peri-implant crestal bone loss have been reported in a number of human clinical trials. Surface modification by acid etching, sandblasting, injection molding, laser micro-patterning and plasma nano-coatings have been suggested to tailor the implant surface for improved cell attachment, proliferation and differentiation during bone healing. Yet, due to a lack of relevant 3D cell-culture models and long-term in-vivo studies, the nature of cell-zirconia surface interactions is insufficiently known. We aim to address the knowledge gaps that exist between material design and manufacturing of zirconia and its final clinical application as dental implant. Using an interdisciplinary research approach, encompassing thorough surface characterization, the biological and microbial responses to modified zirconia implant surfaces will be investigated in vitro using novel 3D cell cultures simulating attachment of both soft (gingiva) and hard tissues (bone) to, respectively, the abutment and fixture part of dental implants. Finally, soft-tissue attachment and osseointegration potential of these surfaces will be assessed by thoroughly characterizing both the soft tissue-abutment and bone-implant interface in a clinically relevant in-vivo model.

Profile

- We are looking for a motivated researcher who is a holder of a university degree (such as 'Master in Dentistry', 'Biomedical Sciences', 'Medicine', 'Biology', 'Bio-science Engineering', 'Pharmacy', etc.).
- Candidate should have a particular interest in biomaterial and cell-biology research.
- Since the project will be performed in an interdisciplinary group within two KU Leuven departments/research groups, profound interest in bridging the gap between dentistry and materials engineering is needed.
- Candidate should be passionate about research with a creative mind-set and enthusiasm to take initiatives to explore innovative ideas.
- Candidate should have good communication skills in written and spoken English.
- Candidate is expected to conduct the project towards a PhD degree in a 4-year time period.

Offer

- A full-time 4-year doctoral position in a young dynamic and stimulating interdisciplinary research group to conduct research towards a PhD at an internationally renowned research university.
- An attractive fully funded salary for 4-years, including a number of additional advantages such as hospitalization insurance, eco-vouchers, reimbursement for commuting by public transport, inexpensive meals, KU Leuven bicycle, etc..
- The opportunity to develop scientific and personal skills. You will be embedded in a work environment with the expertise from various backgrounds, including dentistry, material scientists, mechanical engineers and biologists. Moreover, you will be supervised by well-trained scientists and receive thorough training in conducting research, presentations and writing. Ample networking opportunities will be offered through participation in conferences, workshops and collaboration with local and international research groups.
- A stay in a vibrant environment in the hearth of Europe. Leuven is an attractive European university city with a rich history and a lively atmosphere, for centuries a natural home for researchers and their families; the city was even awarded the title of European capital of innovation 2020 by the European Commission. English is very widely spoken in the city and its surroundings. Public transport is also well organized and widely available (<https://www.leuven.be/>).
- KU Leuven has been a center of learning for nearly six centuries. Founded in 1425 by Pope Martin V, KU Leuven bears the double honor of being the oldest extant catholic university in the world and the oldest university in the low countries. KU Leuven is home to a vibrant community of international students and staff members, with 20% of the university's 63,207 students coming from outside of Belgium. Together, they represent over 140 countries, spread across our various Belgian campuses. KU Leuven and affiliated knowledge institutes provide fertile ground for innovation and high-tech entrepreneurship in the Leuven region. This favorable climate for knowledge-driven entrepreneurship and innovation makes the Leuven region an attractive location for many high-tech companies. Further information can be found on the following webpages of the university:

<https://www.kuleuven.be/english/kuleuven/>

<https://research.kuleuven.be/en/>

<https://gbiomed.kuleuven.be/english/OralHealthSciences>

<https://gbiomed.kuleuven.be/biomat>

<https://www.mtm.kuleuven.be/english>

<https://set.kuleuven.be/phd/shapetheworld/living-in-flanders>

<https://www.kuleuven.be/english/life-at-ku-leuven/money-matters/cost-of-living-in-belgium>

Interested?

For more information, please contact Prof. dr. Stevan Čokić via email: stevan.cokic@kuleuven.be

Interviews will take place in November. Intended project start date: Early December 2023 or as soon as possible thereafter.

An application requires a written solicitation, extended CV, contact information for three references and transcripts of academic records. English Proficiency Certificate might be needed if you have not obtained a previous diploma in a program taught in English.

The selection will be based on the comparison of the submitted applications, followed by an interview with the pre-selected candidates.

You can apply for this job no later than November 06, 2023 via the online application tool :

<http://www.kuleuven.be/eapplyingforjobs/light/60243653>

KU Leuven seeks to foster an environment where all talents can flourish, regardless of gender, age, cultural background, nationality or impairments. If you have any questions relating to accessibility or support, please contact us at diversiteit.HR@kuleuven.be.