

高分子学会九州支部 外国人学者講演会

Designer materials for biomedical engineering

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■ 場 所 九州大学先導物質化学研究所 (CE41) 第1セミナー室 A・B

英国グラスゴー大学 Nikolaj Gadegaard 博士は、高分子ソフトマテリアルナノ微細加工、医療材料工学、ナノバイオ界面、研究分野で著名な若手教授であり、国際的な研究ネットワークの中心研究者です。高分子ナノ微細加工表面と生体成分・細胞との相互作用を分子レベルで理解し制御する技術、先進医療・再生医療へ展開するために必要なスマート高分子表面の設計技術についてご講演いただきます。

Our expectations to wellbeing and healthcare is ever increasing and is constantly challenged in a socioeconomic context. This puts a continuous demand on new or smarter materials used in health and medical applications. Although new materials are constantly developed, “re-engineering” of existing materials is an attractive solution as the approval process is faster. In this talk I will discuss how modern engineering methods can be applied to; firstly understand the biological requirements for a given biomedical application, and secondly how we can specifically engineer materials to meet those needs. Our approach has been the use of nanoscale engineering to elicit the required biological responses. In our work, these length scales are reached using semiconductor techniques such as electron beam lithography and reactive ion etching. The advantage behind this approach is the ability to specifically design at a length scale comparable to the building blocks of life: cells and proteins. During the past decade, we have developed a range of tools to 1) provide flexible lithography, 2) supporting tools for biological experiments, 3) means of upscaling for large areas and large part numbers and 4) computational methods for analysis and modelling. Each of these areas will be discussed in this presentation. We will summarise the talk with suggestions of how nanoscale engineering can be used to provide smarter materials for future biological and healthcare solutions. This will include organs-on-a-chip and its associated engineering technologies and challenges.

Nikolaj Gadegaard is professor of Biomedical Engineering and Director of Research in the School of Engineering at the University of Glasgow. With an educational background in Chemistry, Physics and Biophysics, and having worked at the interface of physics/engineering and biology for more than two decades, he is a well-suited member of the team. He is an expert on the use of micro- and nanofabrication technologies for biomedical applications and has published more than 150 papers in e.g. Nature family journals, Advanced Materials, ACS nano and JACS with more than 11.000 citations and an h-index for 47. In 2015 he was awarded an ERC consolidator grant (FAKIR) to study the cellular dynamics of cells on nanostructured materials. This work combines precision engineering with state-of-the-art super resolution microscopy and FRET imaging for spatial mapping and mechanotransduction events, respectively.

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