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Lecturer: **Prof. Kurosch Rezwan**, Advanced Ceramics, Faculty of Production - Chemical & Mechanical - Engineering, University of Bremen, Germany:

Title: ***Multiscale Research and Engineering of Advanced Ceramics at the Biology Interface***

Abstract: As a consequence of the growing and aging global population, the increasing numbers of industrialised countries as well as limited natural resources, questions concerning health, a clean environment, sustainable technologies and green chemistry have become of paramount importance. In search for novel approaches, these questions have rapidly propelled the evolvement of biomedical, biotechnological and environmental research areas. During the past two decades it has become evident, that tailoring material's functionality at the biology interface ("biointerface") has to be considered as one of the prospective key technologies to cope with the tremendous challenges being faced in these major areas[1]. Tailoring of material substrates to be used as e. g. advanced filters and adsorbents, diagnostic devices, biochemical reactors and drug release carriers in the aforementioned areas will deliver - undoubted - a great societal and economical impact. It is well known, that material morphology and surface properties affect strongly the overall performance at the biointerface. Therefore not only the surface chemistry but also e. g. surface porosity, morphology and microstructural composition are crucial for the overall material performance, impacting biomolecular reaction kinetics, diffusion paths and overall efficiency. While some of these aspects were investigated in literature, the complex interplay of all aspects remains up-to-date unclear and comprehensive tailoring of materials surfaces as an enabling technology still an outstanding challenge.

References to be found on the second page. Download on:
http://www.unicat.tu-berlin.de/Colloquia-2013.769.0.html

Find out more on Prof. Rezwan on: http://www.ceramics.uni-bremen.de/Group/Rezwan.html

Date: **Wednesday, August 21st, 2013 at 4:00 pm**

Location: **TU Berlin, Gerhard Ertl Center**
Marchstr. 6, 10587 Berlin
Building BEL, Meeting Room BEL 301

Organizer: **Dr. Oliver Görke (TUB) and**
Prof. Matthias Driess (TUB)

Coffee and tea will be served thirty minutes prior to the lecture start.
Guests are cordially invited to attend!

Prof. Dr. Matthias Driess, Chair of the Cluster of Excellence UniCat

Special UniCat Colloquium

Wed, August 21st, 2013 at 4:00 pm at
TU Berlin, Gerhard Ertl Center, Marchstr. 6, 10587 Berlin, Meeting Room **BEL 301**:

Prof. Kurosch Rezwan, University of Bremen, Germany:

Multiscale Research and Engineering of Advanced Ceramics at the Biology Interface

As a consequence of the growing and aging global population, the increasing numbers of industrialised countries as well as limited natural resources, questions concerning health, a clean environment, sustainable technologies and green chemistry have become of paramount importance. In search for novel approaches, these questions have rapidly propelled the evolvement of biomedical, biotechnological and environmental research areas. During the past two decades it has become evident, that tailoring material's functionality at the biology interface ("biointerface") has to be considered as one of the prospective key technologies to cope with the tremendous challenges being faced in these major areas[1]. Tailoring of material substrates to be used as e. g. advanced filters and adsorbents, diagnostic devices, biochemical reactors and drug release carriers in the aforementioned areas will deliver - undoubted - a great societal and economical impact. It is well known, that material morphology and surface properties affect strongly the overall performance at the biointerface. Therefore not only the surface chemistry but also e. g. surface porosity, morphology and microstructural composition are crucial for the overall material performance, impacting biomolecular reaction kinetics, diffusion paths and overall efficiency. While some of these aspects were investigated in literature, the complex interplay of all aspects remains up-to-date unclear and comprehensive tailoring of materials surfaces as an enabling technology still an outstanding challenge.
Particularly advanced ceramics such as alumina (Al_2O_3), zirconia (ZrO_2), titania (TiO_2), silica (SiO_2) and calcium phosphate (hydroxyapatite crystal phase) are ideal candidates for biomedical, biotechnological and environmental applications due to their outstanding chemical robustness, non-toxic behaviour as well as hydrophilic surface properties while featuring a mechanical resistance superior to polymers or metals. Advanced ceramics, as in contrast to metallic or polymer substrates, do not release contaminating ions or monomers as their solubility is generally very low in the pH range of interest between 5 - 8[2]. By functionalising the surface with inorganic, organic and biological compounds a great number of functional properties can be combined with the advantages of a chemically robust, but at the same time modifiable material substrate[3-14]. Other and our own studies have shown that advanced ceramics are therefore of a particular interest for biomolecule, virus or bacteria filtration and adsorption as well as for drug delivery systems[10, 15-23]. Key ideas and findings of these studies will be highlighted in this talk and discussed.

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