MM 50: Biomaterials and Biological Materials III

Time: Thursday 10:15–11:45 Location: TC 006

Topical Talk MM 50.1 Thu 10:15 TC 006

Entwicklung von bioresorbierbaren Magnesiumimplantaten für individuelle Kontinuitätsdefekte in der MKG-Chirurgie — •Ralf Smeets[1], Ole Jung[1], Henning Hanken[1], Max Heiland[1], Christoph Ptock[2], Max Schwade[3], Alexander Kopp[2] und Philip Hartjen[1] — [1]Klinik und Poliklinik für Mund-, Kiefer- und Gesichtschirurgie, Universitätsklinikum — [2]Meotec GmbH & Co. KG — [3]Werkzeugmaschinenlabor WZL der RWTH Aachen

Großvolumige Knochendefekte nach Trauma- oder Tumorresektionen im Gesichtsbereich erfordern den Einsatz von Knochentransplantaten oder rekonstruktiven Materialien wie Titan. Herkömmliche Verfahren ziehen oft erneute operative Eingriffe mit entsprechenden Morbiditäten und möglichen Komplikationen für den Patienten nach sich. Das Projekt BIOMAGIK verfolgt die Entwicklung von Implantaten aus Magnesium, die durch ihre vollständige Degradierbarkeit und knochenähnlichen Eigenschaften die bestehenden Probleme lösen sollen. Die Implantate werden durch funkenerosive Bearbeitung maßgeschneidert und mit einer osseoinduktiven Makrostruktur versehen. Das Degradationsprofil wird durch Konversion der Oberfläche in eine resorbierbare Keramik optimiert. Hier zeigen wir die Charakterisierung der Implantatmaterialien hinsichtlich Degradationskinetik, in vitro Biokompatibilität und Oberflächeneigenschaften.

MM 50.2 Thu 10:45 TC 006

Response of rat bone structure and mineralization to a degrading Magnesium implant — Tilman Grünewald[1], Harald Rennhofer[1], Martin Meischel[1], Vicki Nue[2], Bernhard Hesse[3], Manfred Burghammer[3], Alessandra Gianoncelli[4], Henrik Birkedal[2], Marine Cotte[3], Annelie Weinberg[5], Stefanie Stanzl-Tschegg[1], and •Helga Lichtenegger[1] — [1]Inst. of Physics and Materials Science, Univ Natural Resources and Life Sciences, Vienna, Austria — [2]iNANO, University of Aarhus, Denmark — [3]ESRF, Grenoble, France — [4]Elettra Sincrotrone, Trieste, Italy — [5]Dept. Orthopedics & Orthopedic Surgery, Med Univ Graz, Austria

Biodegradable bone implant materials are of special interest for medical application specifically in children, where traditional implants have to be removed in a second surgery in order not to disrupt bone growth. In this study we investigated the response of bone mineralization to a degradable Mg implant in a rat model (Sprague-Dawley rat) over a growth period from 1-18 months. Alterations in the bone nano- and mineral structure were investigated by synchrotron-based methods such as small-angle x-ray scattering (SAXS) and diffraction (XRD), x-ray fluorescence (XRF), as well as x-ray absorption spectroscopy (XAS) at a spatial resolution of about 3 micrometer. The combined study showed nanostructural changes at the interface to the degrading implant, but also changes in the bone mineral structure by the presence of Mg ions. Interestingly Mg enrichment was also found around blood vessels several hundreds of micrometer away from the bone-implant interface, which sheds light on possible Mg transport mechanisms.

Topical Talk MM 50.3 Thu 11:00 TC 006

3D scaffolds as cell adhesion templates — •Christine Selhuber-Unkel — Biocompatible Nanomaterials, Institute of Materials Science, University of Kiel, Kiel, Germany

3D biomaterial scaffolds are promising materials for mimicking the natural environment of many cell types. In particular, materials with high structural flexibility offer interesting possibilities, e.g. for mimicking extracellular matrix in order to achieve directed cell growth. We have developed methods to generate 3D biomaterials that contain interconnected structural micro- and nanoelements. In addition to controlling scaffold structure and porosity, we can also define scaffold stiffness, conductivity and surface functionalization. Intriguingly, cells can grow deeply into such scaffold materials and the scaffolds can induce cell functionalities, thus possibly leading to future tissue engineering applications.

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