

Materials Science Seminars

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Department of
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UC San Diego
Jacobs School of Engineering



Samueli
Materials Science & Engineering

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Title: Bioactive glasses meet 3D bioprinting: advances and challenges for tissue engineering applications

Presenter: Dr. Aldo R. Boccaccini
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Time:

10:00 AM - 11:00 AM (Pacific time)

Connection:

Zoom meeting ID: 842 506 6501
Password: 587901

In 2021 we celebrate 50 years of bioactive glass (BG), the first man-made material capable to bond to tissues, discovered by the late Prof. Larry L. Hench [1]. The "traditional" applications of BGs have been in bone substitution, for example as bone defect filler, small bone and dental implants and coatings for orthopedic applications. More recently, BGs are being increasingly considered in the tissue engineering (TE) field, expanding from bone to soft TE. Such TE applications are based on the biochemical reactions occurring at the interface between BG surfaces and the biological environment, which involve the (controlled) release of biologically active ions as BG dissolution products [2]. In this context, applications of bioactive glasses in the field of 3D bioprinting (biofabrication) have been emerging in the last few years. In this presentation, the progress in the development and characterization of TE scaffolds made purely from BGs or by combining BGs and biopolymers, including their application in biofabrication (3D bioprinting) approaches will be discussed with focus on the influence of different biologically active ions released from BGs on the processing and properties of the constructs. In the field of bioactive glasses for both bone and soft TE, examples of such applications will be presented with focus on the development of hydrogel-bioactive glass composites as innovative bioinks for cell encapsulation and for 3D bioprinting of cell laden scaffolds [3].

[1] L.L. Hench, et al., Bonding mechanisms at the interface of ceramic prosthetic materials, *J. Biomed. Mater. Res.* 5 (1971) 117-141. [2] A. Hoppe, et al., A review of the biological response to ionic dissolution products from bioactive glasses and glass-ceramics, *Biomaterials* 32 (2011) 2757-2774. [3] S. Heid, A. R. Boccaccini, Advancing bioinks for 3D bioprinting using reactive fillers: A review, *Acta Biomater.* 113 (2020) 1-22.

Aldo R. Boccaccini is Professor and Head of the Institute of Biomaterials at University of Erlangen-Nuremberg, Germany, a position he has held since 2009. He is also visiting Professor of Materials Science at Imperial College London, UK. He holds a nuclear engineering degree from Instituto Balseiro (Argentina) (1987), Dr-Ing. (PhD) from RWTH Aachen University (Germany) (1994) and Habilitation from Technical University Ilmenau (Germany) (2001). Prior to his current position, he spent 10 years at Imperial College London, Department of Materials, as Lecturer, Reader and Professor of Materials Science. He has held post-doctoral positions at University of Birmingham (UK) and University of California, San Diego (USA). The research activities of Prof. Boccaccini are in the field of ceramics, glasses and composites for biomedical, functional and/or structural applications. He is the author or co-author of more than 1000 scientific papers and 25 book chapters. His work has been cited more than 39,900 times (h-index = 88: Web of Science®; h-index= 110: Google Scholar®).

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