

ICB PhD public presentations

## DESIGN AND ENGINEERING OF GRANULAR HYDROGELS FOR BIOMEDICAL APPLICATIONS

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**ETH Hönggerberg, HCI H 2.1 and on Zoom**

(<https://ethz.zoom.us/j/5376127981>)

**Project Summary:** Polymeric materials are commonly employed to mimic the biomechanical and biochemical milieu of endogenous cells, due to their similarity to native tissues that support cellular attachment and proliferation. Traditional bulk hydrogels, however, fall short in sustaining long-term biofunctionality because of their static nature and the strong coupling of matrix stiffness and porosity. To this end, granular hydrogels have emerged as a promising modular and injectable platform. However, their rational design and engineering remain limited due to a lack of understanding of the underlying micro-scale phenomena. In this work, we advance our fundamental understanding of the emergent properties in granular hydrogels and predict their macroscale mechanics. We further leverage these insights to introduce dynamic reinforcement via reversible boronic-ester interactions. We design a versatile microfluidic platform to assess cell interactions with granular hydrogels. Importantly, we engineer an immunomodulatory granular hydrogel to address the aberrant signalling in chronic wounds and frame a design strategy for the capture and release of signalling molecules. The findings we present in this work improve our ability to engineer this unique class of materials for innovative biomedical applications.

**CV.** Börte received her BSc. in chemistry from Bilkent University, Turkey. Afterwards, she performed her MSc. at D-CHAB in 2017 where she worked with Prof. Andrew deMello. In 2018, she started her joint PhD studies between the groups of Prof. Andrew deMello and Prof. Mark Tibbitt at D-MAVT working on the design and engineering of granular hydrogels for regenerative medicine.