IAP Seminar

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Tuesday, 12th March 2024, 16:00 s.t.
TU Wien, Institut für Angewandte Physik, E134
1040 Wien, Wiedner Hauptstraße 8-10
Yellow Tower „B“, 5th floor, SEM.R. DB gelb 05 B

Growth, Distribution, and Photosynthesis of Chlamydomonas Reinhardtii in 3D Hydrogels

Engineered living materials (ELMs) are emerging class of functional materials, often fabricated by incorporating living cells within an inert polymer matrix to form desired functions. Photosynthetic microorganisms can be integrated into polymeric matrices to form ELMs with plant-like qualities, allowing them to photosynthesize and thus to provide a localized O_2 source and/or CO_2 sink. Unraveling the formation, spatial localization, and behavior of photosynthetic cell populations within an artificial niche is a prerequisite for predicting and intensifying the functions of living materials. Our group focuses on the growth and spatial distribution of eukaryotic microalgae *Chlamydomonas reinhardtii* within hydrogel networks for the strategic fabrication of living materials with intensified CO_2 capture. Existing unicellular microalgae within scaffolds form multicellular algal aggregates, called palmelloid, around the surface of bioprints, which play a crucial role in forming the functional surfaces of materials. With increasing depth of the matrix, the number and volume of cellular clusters decrease due to photon attenuation and limited air transfer. By tailoring material thickness and increasing the exposure of palmelloid to its circumjacent environments, the CO_2 capturing performance of bioprints can be enhanced. Interestingly, material designs to regulate photosynthetic activity show similarities to the strategies for intensifying photosynthetic activity inspired by plant leaves. Our results imply that the spatial control of cell population can control the function of ELMs and can be exploited for biomimetic structural research for leaf mimicry.

All interested colleagues are welcome to this seminar lecture (45 min. presentation followed by discussion).

Friedrich Aumayr
(LVA-Leiter)

Richard Wilhelm
(Seminar Chair)