TOR VERGATA
UNIVERSITÀ DEGLI STUDI DI ROMA

Dipartimento di Scienze e Tecnologie Chimiche

AVVISO DI SEMINARI

Il giorno 22/04/2026 alle ore 12:00

nell'Aula Seminari del Dipartimento di Scienze e Tecnologie Chimiche

Prof. Jonathan M. Zuidema

Assistant Professor and Lighthouse Beacon Foundation Scholar

Department of Mechanical Engineering, University of Kentucky

Terrà un seminario dal titolo:

Multiscale Biomaterials Chemistry: Towards Nervous System Repair

Proponente: Prof. Alessandro Porchetta

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Abstract:

The versatility of multiscale biomaterials can be exploited to improve outcomes across the field of tissue engineering. Inorganic, mesoporous nanoparticles, including porous silicon and mesoporous silica nanoparticles, offer several advantageous properties, including high surface area and pore volume for drug loading, ease of surface chemistry modifications, tunable nanoparticle size and pore diameters, and are biodegradable/biocompatible, making them attractive nanocarriers for drug deliver applications. These properties also make them especially useful in the incorporation of nanoparticles into biomaterial scaffolds to alter material properties, protect sensitive therapeutics during fabrication, and tailor drug release properties. Microgels, hydrogels composed of microparticles ranging in size from 1-1000 μm, have begun to emerge as one of the most promising building blocks of three dimensional structures. This is due to their unique properties, including porosity between particles allowing for cellular infiltration and nutrient/waste exchange, large surface area to volume ratios increasing cellular adhesion points, and shear-thinning enabled injectability. Using these nano- and micro-scale materials as building blocks, we are creating digital light projection, 3D-printed macrostrucutres composed of these materials to interface and improve outcomes in the nervous system. Integrating nanoparticle and microgel design concepts into multiscale biomaterials engineering holds great promise across bioengineering.

Reference

[1] Zuidema, J. M., Ajò, A., Carofiglio, M., & De Cola, L. (2025). Cross-Linking PEG Microgels with Mesoporous Organosilica Nanoparticles to Engineer Microporous Annealed Particle Scaffold Properties. ACS omega, 11(1), 746-756.

[2] Morillas-Becerill, L., De Cola, L., & Zuidema, J. M. (2022). Inorganic nanoparticle empowered biomaterial hybrids: Engineered payload release. Frontiers in Nanotechnology, 4, 999923.

[3] Zuidema, J. M., Dumont, C. M., Wang, J., Batchelor, W. M., Lu, Y. S., Kang, J., Bertucci A, Ziebarth N, Shea L, and Sailor, M. J. (2020). Porous silicon nanoparticles embedded in poly (lactic-co-glycolic acid) nanofiber scaffolds deliver neurotrophic payloads to enhance neuronal growth. Advanced functional materials, 30(25), 2002560.

[4] Waggoner, L. E., Kang, J., Zuidema, J. M., Vijayakumar, S., Hurtado, A. A., Sailor, M. J., & Kwon, E. J. (2022). Porous silicon nanoparticles targeted to the extracellular matrix for therapeutic protein delivery in traumatic brain injury. Bioconjugate chemistry, 33(9), 1685-1697.