

HYBRID NANOSCALE BIO-ADDITIVE MANUFACTURING FOR TISSUE REGENERATION

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Abstract: Nanoscale topographies mediated with biomolecules play a vital role in cellular differentiation and proliferation. Our group explores the effect of nanoscale topographies embedded with bone morphogenetic protein (BMP-2) growth factors for stem-cell based osteochondral tissue regeneration. Hybrid bioprinting will be elaborated combining microextrusion, direct-write inkjet and nanoimprint lithography to define hierarchical nano/micro architectures for tissue engineering application. The ability to deposit heterogeneous biostructures on-the-fly both in terms of geometry and material composition will create an effective method to building biomimetic functionally gradient topographies. Current scaffold fabricating technologies limited to predetermined pattern designs (lower aspect ratio) and need retooling of entire setup for variations in topology. Proposed approach enables precise placement of bio-media on custom patterned surfaces to create “niche” microenvironments directing cellular fate and function of tissue constructs.

Bio: Dr. Salil Desai is the University Distinguished Professor and Director of the Center of Excellence in Product Design and Advanced Manufacturing at North Carolina A&T State University. Desai is recipient the Presidential Award for Excellence in Science, Technology Engineering and Mathematics Mentoring from the White House for his exemplary contributions to advanced manufacturing through translatory research. His expertise is in the areas of hybrid additive, nano and bio manufacturing, smart cyber-physical systems, multiphysics modeling, and regenerative tissue engineering. For his seminal contributions, Desai is recipient of several prestigious awards including the NSF CAREER Award, UNC Board of Governors Award, Outstanding Investigator Awards from the Oak Ridge National Laboratory, Department of Defense, and professional societies including the Society of Manufacturing Engineers, American Society of Mechanical Engineers, Institute of Industrial & Systems Engineers, and the American Society of Education Engineers. He is Associate Editor of the IISE Transactions and is Fellow of the ASME, IISE and AIMBE.

