

NSF Nanomanufacturing Research and Future Opportunities

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Abstract: Nanomanufacturing is the fabrication of nanoscale building-blocks, their assembly into higher-order structures, and the integration of these into larger scale systems. Nanomanufacturing research is the study of processes and methods to manipulate and control matter at the nanoscale in 1-, 2-, and 3-dimensions, *reproducibly*. NSF has been at the forefront of nanomanufacturing research since the early days of the NNI. This talk covers basic research activities and accomplishments in nanomanufacturing, scalable nanomanufacturing, manufacturing NSECs and nanosystems ERCs. Today, the Nanomanufacturing program is part of the Advanced Manufacturing program, which explores manufacturing at all scales, additive and subtractive processes, biomanufacturing, and cybermanufacturing and seeks to leverage AI and ML techniques for process monitoring, control and optimization, high yield and quality assurance. Furthermore, nanomanufacturing plays an important role in cross-cutting programs such as Future Manufacturing, which seeks manufacturing capabilities that do not exist today, and is expected to impact areas such as quantum engineering and bioengineering.

Bio: Dr. Khershed Cooper is a Program Director of the Advanced Manufacturing Program in the CMMI Division at the National Science Foundation. Currently he is on detail to NSF's Office of International Science and Engineering (OISE) where his responsibilities are to identify and develop international research collaboration opportunities and design engagement strategies. As a program director for advanced manufacturing, he directs basic research activities in advanced manufacturing, and associated Manufacturing USA and NSF-DFG (Deutsche Forschungsgemeinschaft) collaborations. He is a disciplinary program officer for the Engineering Research Centers and cross-cutting programs, such as, Critical Aspects of Sustainability, Emerging Frontiers in Research and Innovation, NCN's nanoMFG node and National Nanotechnology Coordinated Infrastructure. He is an NSF representative for NSTC's Nano Science Engineering and Technology Sub-committee. Prior to joining NSF, Dr. Cooper was a Program Officer for the Manufacturing Science at the Office of Naval Research and, concurrently, a Senior Research Metallurgist at the Naval Research Laboratory. He received his MS and PhD from University of Wisconsin - Madison, his BTech from IIT-Bombay. He has nearly 200 invited talks, 70 contributed presentations, 150 publications, edited one book, has one patent and has sponsored international studies, symposia and workshops in various areas of advanced manufacturing. He is a Fellow of SME and ASM International and a recipient of ASM International's Burgess Memorial Award.