

PERSPECTIVES IN NANOMANUFACTURING: FROM THE BENCH TO THE MARKETPLACE

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Abstract: Nanomanufacturing strategies for the scale-up of nanomaterials, devices, and systems are garnering increased interest, especially as the field of nanoscience and technology matures and such components are being used more widely, and even commercially. Indeed, TERA-print, Stoicheia, and Azul 3D, companies spun out of work initiated at my laboratory at Northwestern University, have taken innovative approaches to the practice of nanomanufacturing and can be used as examples to illustrate the present and future of nanomanufacturing endeavors. TERA-print has created desktop fabs that can produce what used to take massive infrastructure at remote sites at the point-of-use. Stoicheia is accelerating the development of new tools for materials discovery and production and integrating big data and artificial intelligence to define the materials genome. Azul3D has developed a stereolithographic three-dimensional printing approach that is rapid, continuous, and size unrestricted, and it has been employed to manufacture face shield parts for healthcare workers on the frontlines of the COVID-19 pandemic, sporting goods, and parts important in the semiconductor electronics sector. In this talk, key messages, perspectives, and visions for the future of nanomanufacturing will be discussed using these companies and the associated technologies as case studies.

Bio: Dr. Chad Mirkin is the Director of the International Institute for Nanotechnology and the Rathmann Professor of Chemistry, Chemical & Biological Engineering, Biomedical Engineering, Materials Science & Engineering, and Medicine at Northwestern University. He is a chemist and nanoscientist, known for his discovery and development of spherical nucleic acids and biodetection and therapeutic schemes based on them, Dip-Pen Nanolithography and related cantilever-free chemical synthesis and materials discovery methodologies, and contributions to supramolecular chemistry, nanoparticle synthesis, and nanomanufacturing. He has authored >820 publications and >1,200 patent applications (>390 issued) and founded eight companies, including Exicure, TERA-print, Azul 3D, and Stoicheia. Mirkin has been recognized with >230 awards, including the Kabiller Prize in Nanoscience and Nanomedicine, SCI Perkin Medal, and NAS Sackler Prize in Convergence Research. He served on the President's Council of Advisors on Science & Technology, and he is one of very few individuals to be elected to all three US National Academies. He is a *PNAS* Editorial Board Member and was an Associate Editor of *JACS*. He has given >870 invited lectures and educated >300 graduate students and postdoctoral fellows (>120 are now faculty members).