Indian Institute of Science
Centre for BioSystems Science and Engineering
BSSE Seminar

16 November 2020, 04:00 p.m., Virtual

From high performance 3D printing of hydrogels to industrial pharmaceutical development

Dr. Amol A. Pawar,
Novartis

About the speaker:

Dr. Amol A Pawar has a multidisciplinary experience comprising 9 years in academic research and 6 years in corporate pharmaceutical R&D (current). His post-doc research in Applied Chemistry at The Hebrew University of Jerusalem, Israel (2014-2016) focused on polymer stabilized amorphous solid dispersions and 3D printing of hydrogels. His PhD in Chem. Engg. (2008-2013, IIT Bombay) investigated aerosol routes of nanoparticle synthesis and his M.S.Pharm in Pharmacology & Toxicology (NIPER, Mohali, 2005-2007) focused on chemoprotection against anti-cancer drugs. His contributions has been published as 06 granted patents, 07 Patent Applications and 14 research articles. His work on photoinitiator-nanoparticles, has been recently commercialized by Merck, which enables 3D printing of hydrogels in water. He has recently joined as Principal Scientist in Pharmaceutical Development Division of Novartis. His earlier stint was with Dr. Reddy's as a Process Engineer wherein he was involved in process engineering & scale up of pharmaceutical products. His work in Wockhardt and Microlabs acquainted him to corporate strategic planning and intellectual property management.

Abstract:

The talk will be divided in two parts, one about the research that enabled high performance 3D printing of hydrogels and other about insights of transition from academic research to industrial research.

In first part, we will discuss about a new approach enabling rapid 3D printing of hydrogels in aqueous solutions is presented on the basis of UV-curable inks containing nanoparticles of highly efficient but water-insoluble photoinitiators. The extinction coefficient of the new water-dispersible nanoparticles of 2,4,6-trimethylbenzoyl-diphenylphosphine oxide (TPO) is more than 300 times larger than the best and most used commercially available water-soluble photoinitiator. The TPO nanoparticles absorb significantly in the range from 385 to 420 nm, making them suitable for use in commercially available, low-cost, light-emitting diode–based 3D printers using digital light processing. The polymerization rate at this range is very fast and

enables 3D printing that otherwise is impossible to perform without adding solvents. The TPO nanoparticles were prepared by rapid conversion of volatile microemulsions into water-dispersible powder, a process that can be used for a variety of photoinitiators. Such water-dispersible photoinitiator nanoparticles open many opportunities to enable rapid 3D printing of structures prepared in aqueous solutions while bringing environmental advantages by using low-energy curing systems and avoiding the need for solvents.

Second part aims to acquaint PhD scholars with industrial research, particularly pharmaceutical research. With my ongoing personal experience, I intend to share what helped me getting into industry, journey in an unknown territory of industrial research, what we (PhD Graduates) bring to the industry and what new we learn in an industry.