Mesoporous Silicon in Degradable Drug Delivery Systems

Michael J. Sailor, Yi-Sheng Lu, Sanahan Vijayakumar, Gabriella Stark
[1]University of California, San Diego, La Jolla, California, USA

msailor@ucsd.edu

This presentation will discuss the challenges associated with long-acting controlled release systems and peptide-targeted nanoparticle delivery systems based on mesoporous silicon. For many decades, applications in microelectronics, solar energy harvesting, secondary batteries, and chem/bio sensing have driven development of the chemistry of crystalline silicon. These applications have emphasized maximizing long-term stability, under demanding chemical environments. More recently, applications in nanomedicine have reset the requirements substantially; to be useful in this domain, the silicon-based material often must dissolve smoothly and slowly, or in response to precisely defined triggers. The effective trapping and the retention of function of biologic molecules (proteins and nucleic acids) within the confines of a mesoporous silicon nanostructure will be discussed. Because of their sensitive nature, biologics must use trapping chemistries that operate under mild conditions to immobilize and confine the biologic without inducing denaturation or hydrolytic decomposition. This presentation will focus on the influence of materials and chemical parameters on the performance of mesoporous silicon microparticles and nanoparticles in vitro and in vivo.