TOR VERGATA
UNIVERSITÀ DEGLI STUDI DI ROMA

Dipartimento di Scienze e Tecnologie Chimiche

AVVISO DI SEMINARIO

Il giorno 15 giugno alle ore 15:00

in aula 12

Il **Prof. Nikhil Singha**
PhD

Institute of Technology, Kharagpur, India

terrà un seminario dal titolo

DESIGNING SMART GLYCOPOLYMERS:
THEIR APPLICATIONS IN CANCER THERAPY

Proponenti: Prof. G. Paradossi
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Abstract

Glycopolymers belong to a special class of synthetic polymers bearing pendant sugar units that are receiving considerable attention among the scientific community, because of their interesting properties and applications in the living system. The multivalent interaction between the sugar units and carbohydrate receptors (lectins) plays the key role in its biological activity. Therefore, it is crucial to manipulate the sugar density, length, and architecture of the glycopolymer to control the binding rates with lectins. Currently, the major application of glycopolymers is in the field of pathogen inhibition and cancer therapy due to their excellent bio-recognition properties. Herein, we investigated the lectin binding efficiency of an octa-arm star glycopolymer as a function of its chain length. It was observed that the binding constant value increases with the increase in glycopolymer chain length. In another study, gelatin quantum dot-tagged fluorescence active redox-responsive glycopolymer nanogel was developed via reversible addition−fragmentation chain-transfer (RAFT) polymerisation. An anticancer drug, Doxorubicin (Dox), was loaded in the nanogel and its efficacy was studied over MDA MB 231, a human breast cancer cell line. The efficacy of synergistic chemo-photodynamic therapy was studied in a subsequent investigation to enhance the therapeutic efficacy of the system. A gold nanoparticle (NPs) embedded pH-responsive glycopolymer was synthesized via RAFT polymerisation and was attached with Dox as well as with a photosensitizer. The system demonstrated a synergistic effect of chemo-photodynamic therapy when exposed to 630 nm LED light. This talk will delineate the design of tailor-made glycopolymers with well-defined architecture via RAFT polymerisation technique and their applications in the study of glycopolymer-lectin interaction, bioimaging, drug delivery and phototherapy for cancer treatment.

Keywords: Glycopolymer, Carbohydrate, RAFT, Cancer therapy, glutathione, dynamic chemistry, photodynamic therapy

Short Biography of Professor Nikhil Singha. Dr. Nikhil Singha is a full professor at the Indian Institute of Technology, Kharagpur, India. He obtained his PhD from the Indian Institute of Technology (IIT) Bombay, India, while conducting his research at the National Chemical Laboratory (NCL), Pune, under the supervision of Dr S. Sivaram. He had spent several years conducting research at DSM Research in the Netherlands, the Dutch Polymer Institute and Eindhoven University of Technology in the Netherlands, TNO Industries in the Netherlands, and the University of Tennessee, Knoxville, USA. He is a recipient of several awards, like the Faculty Excellence Award 2022 (IIT Kharagpur) (2022), Prof. M. Santappa award (2014), MRSI Medal (2013), Fulbright Fellowship (USA) (2013), DAAD Fellowship (Germany) (2011), DFG-INSA fellowship (2008) and Fellowship from EPFL, Swiss Federal Institute (2009), fellowship from Royal Society Chemistry, UK (2006). He is a Fellow of the Royal Society of Chemistry (FRSC). His research interest includes the tailor-made functional polymers as well as Thermoplastic Elastomers (TPE) based on block, graft, brush-like, multi-armed star copolymers via controlled radical polymerization. He explored dynamic adaptive networks, including mechano-adaptive networks using different “Click Chemistry” in different functional polymers for various speciality applications. He also works in designing smart polymer gels based on glycopolymers and polyzwitterions and their application in cancer therapy, drug delivery, anti-fouling coatings etc. He has >200 publications, filed 22 patents and edited five books. He is an Editorial board member of European Polymer Journal (Elsevier), SPE Polymers (Wiley online), and Associate Editor in Frontiers in Chemistry, Polymer Section. He has served as a Guest Editor for the European Polymer Journal (Elsevier) and the Journal of Materials Science: Composites (Springer Nature) on various special issues.