POLYISOCYANOPEPTIDES HYDROGELS AS ULTIMATE BIOMIMETIC CYTOSKELETAL NETWORKS FROM SOLAR CELLS TO DRUG DELIVERY: 'THE IMPORTANCE OF MACROMOLECULAR STIFFNESS'

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ABSTRACT

The cytoskeleton is a network of semi-flexible linear protein polymers (actin filaments, microtubules, and intermediate filaments) that is responsible for the mechanical functions of cells. These cytoplasmic materials differ from common polymer materials in both the complexity of composition and the fact that the systems are not at a thermodynamic equilibrium. Despite the numerous studies carried out to investigate and model the properties of these essential materials, there are no synthetic mimics. In this presentation we will demonstrate the unique cytomimetic properties of hydrogels based on oligo(ethylene glycol) grafted polyisocyanopeptides. These extremely stiff helical polymers form gels upon ***warming*** at concentrations as low as 0.005 %-wt polymer, with materials properties almost identical to those of intermediate filaments. The macroscopic behaviour of these gels can be described in terms of the molecular properties of the basic stiff helical polymer and a multi-step hierarchical self-assembly. The study of these gels and their application in cell growth and drug therapeutics will be discussed.