

A Comprehensive Review on Hydrogel as a Novel Drug Delivery System

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Abstract: *Hydrogel products represent a class of polymeric materials characterized by their hydrophilic networks, which enable them to absorb and retain substantial amounts of water within their three-dimensional structures. Owing to their high-water content, porosity, and soft, elastic consistency, hydrogels closely mimic the physical properties of natural living tissues, surpassing other synthetic biomaterials in this regard. These materials can be engineered into various physical forms, including slabs, microparticles, nanoparticles, coatings, and films, thereby broadening their applicability in biomedical and clinical contexts. Hydrogels are widely utilized in areas such as tissue engineering and regenerative medicine, diagnostics, cellular immobilization, biomolecule or cell separation, and as barrier materials for modulating biological adhesion. Their ability to absorb biological fluids and swell results in a soft, rubber-like texture that enhances their biocompatibility and suitability for interaction with biological systems. This article aims to provide a comprehensive overview of hydrogel classification based on different criteria, along with an examination of their properties, preparation methods, and the physical and chemical characteristics that define these versatile biomaterials.*

Keywords: Applications, current Research on Hydrogels, types, Methods, Characterization, Properties

