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HYDROGEL: A VERSATILE MATERIAL AND ITS APPLICATIONS

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Hydrogels (HGs), or water-based gels, are soft materials formed by a three-dimensional polymeric structure which can be chemically, physically or enzymatically cross-linked. The HGs have attracted considerable attention due to their great promise that they hold for a wide range of applications. The affinity for water, the ability to swell in biological fluids, and their similarity to some natural tissues has made it a material of biological relevance. The capacity of water absorption (ratio of swollen weight to dry weight) depends on the porosity, crosslinking density, and chemical nature of the polymer chains carrying functional groups such as $–NH_2$, –COOH, $–CONH_2$, and $–SO_3H$. Hydrogels may be prepared so that their polymer network (equilibrium swelling and absorption kinetic) undergo changes in response to external stimuli, such as temperature, pH, ionic strength, magnetic field, light, and so on. Both natural and synthetic hydrogels can be addressed to those proposes. For the natural one, the main advantages include cell adhesion and biodegradation. However, such materials have been shown to be mechanically unsatisfactory and potentially immunogenic, restricting the uses above. Thus, the synthetic and natural polymers have been combined to form more efficient hydrogels owing to their well-defined shape being engineered to be degradable and functional. HGs can be engineered to be applied in biosensors, controlled release of drugs, tissue engineering wound dressings, and contact lenses. They can also find efficient applications in agriculture, both as soil conditioners and as nutrient carriers. In this work, our purpose is to show and discuss the most relevant data on the synthesis approach, characterization, as well as their applications focused on agriculture.

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