

Microarchitecture of Water Confined in Hydrogels

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Introduction

When looking at, or holding a hydrogel you get the impression that the gel is a state that is neither completely liquid nor completely solid. The half liquid-like and half solid-like characteristics cause many interesting properties that are not found in either a pure solid or a pure liquid. A hydrogel, as definition, is a three-dimensionally cross-linked polymeric network that is capable of absorbing and retaining huge amounts of water without leaking it. Schematically we can divide the hydrogels into physical and chemical hydrogels according to their constitution as shown in [Fig. 1](#).

In the first case, even if the term physical is not particularly appropriate, the polymer chains are held together by physical interactions such as hydrophobic interactions, hydrogen bonds, electrostatic interactions, and entanglements among chains. The physical hydrogels are reversible under specific conditions causing shape instability and are generally harder than the chemical hydrogels. Alginate is a well-known example of a polymer that forms a hydrogel by ionic interactions (Gacesa 1988). The polymer is a polysaccharide with mannuronic and glucuronic acid residues and can be crosslinked by calcium ions.

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