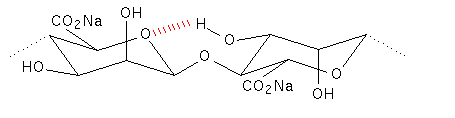
**3- Alginate:**

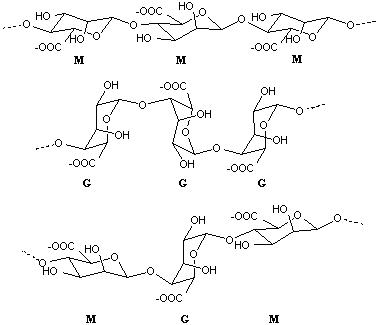
Alginates are cell-wall constituents of brown algae (Phaeophycota). They are chain-forming heteropolysaccharides made up of blocks of mannuronic acid and guluronic acid. Composition of the blocks depends on the species being used for the extraction and the part of the thallus from which extraction is made.





glycosidic linkage

Alginates are linear unbranched polymers containing β-(l→4)- linked D-mannuronic acid (M) and α-(l→4)-linked L-guluronic acid (G) residues. According to the source algae, alginates can consist of blocks of similar and strictly alternating residues (i. e. MMMMMM, GGGGGG and GMGMGMGM), each of which have different conformational preferences and behavior. Alginates may be prepared with a wide range of average molecular weights (50 -100,000 residues) to suit the application.



Because of their abundance in source and low in prices, Alginates have been widely used in the food and pharmaceutical industry as thickeners, emulsifying agents, binder and disintegrating agent for tablet and capsule formulations. Because of their biocompatibility, alginates have been used in medical applications such as wound dressings, scaffolds for tissue engineering and hepatocyte culture and surgical or dental impression materials. Alginates are also known to be broken down to simpler glucose type residues and can be totally absorbed.

When used as biomaterials for implantation or tissue engineering scaffolds, alginates have to be cross-linked. Alginate can be easily cross-linked by calcium ions to form ionic bonding between alginate molecules. The cross-link is a fast process. As an example, cross-linked alginate beads can be obtained instantly by dripping sodium alginate solution into calcium chloride solution.

Because of this useful characteristics, living cells, growth factors and other active

ingredients can be easily encapsulated into calcium ion cross-linked alginate gels. The cross-linked alginate gel can act as an a immunoprotection barrier for its encapsulated living cells. Alginates cross-linked with calcium ions (from CaSO4) have recently been used as cell delivery vehicles for in vivo tissue engineering research .

Alginate can also be easily fabricated into fibers. The fibers can be used to make non-woven fibers for medical applications. For example, non-woven calcium alginate fiber dressings have been used frequently on both full- and partial-thickness wounds. Many studies have shown that these alginate dressings can accelerate epithelialization.

Alginate can also be covalently cross-linked using ethylenediamine in the presence of water-soluble carbodiimide, as carbodiimide will induce cross-links between carboxylic acid and amine groups without itself being incorporated. So ethylenediamine is actually being incorporated as a cross-linker. The covalently cross-linked membrane is easily biodegradable and can reduce foreign-body reactions after healing skin wounds .

- **Alginate uses:**

The uses of alginates are based on three main properties:

* The first is their ability, when dissolved in water, to thicken the resulting solution (more technically described as their ability to increase the viscosity of aqueous solutions).
* The second is their ability to form gels; gels form when a calcium salt is added to a solution of sodium alginate in water. The gel forms by chemical reaction, the calcium displaces the sodium from the alginate, holds the long alginate molecules together and a gel is the result.
* The third property of alginates is the ability to form films of sodium or calcium alginate and fibres of calcium alginates.