

entrap cells and function as an extracellular matrix (ECM) with non-immunogenic and adjustable bioresorption properties [20].

5.3 Types of Interaction of Alginate

Alginate is an anionic copolymer consisting of (1→4)-linked β-D-mannuronic acid (M units) and its C-5 epimer α-L-guluronic acid (G units) with varying compositions and sequences and possesses unique complexation capability with divalent cations such as Ca²⁺ to form the so-called egg-box structure [21].

Under special conditions, alginate would depolymerize to oligosaccharides, monosaccharides, and decomposition products. The modifications in molecular structure and interactions can be verified by Fourier transform infrared spectroscopy spectra and magnetic nuclear resonance.

Alginates can be easily formed into diverse semisolid or solid structures under mild conditions because of their unique ability of sol/gel transition. Therefore, alginates are commonly used as viscosity increasing agents, thickeners, and suspension and emulsion stabilizers in food and pharmaceutical industry. The fact that alginate may undergo *in situ* gelation makes alginate materials promising tools for a wide range of applications, including injectable vehicles for tissue engineering or topical drug delivery systems.

Wang *et al.*, [22] discovered that the sulfated polymannuroguluronate (SPMG), the sulfated form of alginate, is a characteristic anti-AIDS drug candidate, as it caused the inhibition of HIV-1 infection mainly through the robust attachment of virus gp120 protein with CD4 molecules on the surface of T cells. Moreover, there is huge correlation between the size of SPMG oligosaccharides and their inhibitory significance that the octasaccharide will be the minimal active fragment preventing syncytium formation and reducing the P24 core antigen level in HIV-IIIB-infected T lymphoblastoid cell line, CEM cells [23, 24].

Modification or derivatization of alginates or chemical cointegration could alter its solubility, hydrophobicity, and physicochemical and biological characteristics. Grafting and cross-linking are special chemical treatments by which modification of natural polymer can be done that contains abundance of polysaccharides.

In a study, Hussain *et al.*, have prepared a sustained-release gel containing ibuprofen with varying ratios of acrylamide monomer (AAm) and N,N-methylene bisacrylamide (MBA). They found that 4% w/w of AAm and 0.5% w/w of MBA would be able to generate transparent,