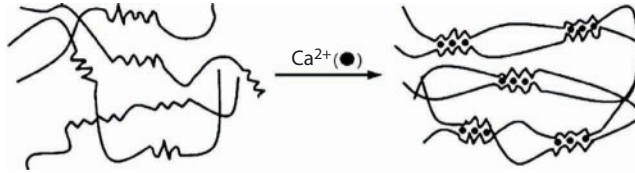

Figure 10.2 The intermolecular cross-linkage of G residues of alginate with Ca2+ ions [12].

of commercially available sodium alginates vary between 32,000 and 40,000 g/mol, whereas intrinsic viscosity (mL/g) and Mv are the viscosity-average molecular weight (g/mol) [18]. The rate of drug delivery, rate of releasing bioactive agents, and encapsulated cell function all depend on adherence of alginate gels. Increased length of G-block and molecular weight of alginates provide mechanical strength to alginate hydrogels. Mechanical strength also depends on sources from where alginates are obtained like *Azotobacter*, which encompasses a high concentration of G-blocks, and the hydrogels that were made by *Azotobacter* alginates have a comparatively high stiffness [17].

The viscosity of alginate solutions depends on the molecular weight of the material and pH. As decrease in pH 3–3.5, there is protonation of carboxylate group from the hydrogen bond in the backbone of the alginate. Increased-molecular-weight alginates improve the quality of alginates-based gel system. Nonetheless, high-molecular-weight alginates are highly viscous, which is usually unwanted in the process of commercially available alginates [19]. That is why the high-viscosity-based alginates are not preferable for the delivery of proteins and cells into the body because of introduction of high shear forces that directly affect the delivered proteins and cells [20]. Highly elastic modulus of alginate gels is generally increased considerably, with the combination of low viscosity and high and low molecular weight alginate polymers [21].

10.3 Extraction and Preparation

For the preparation of alginates, seaweeds, especially algae, are harvested and air-dried before they are further processed. The algal material is treated with dilute mineral acid for the degradation of neutral homopolysaccharides like laminarin and fucoidin that are associated with alginates. Concurrently, there is an exchange of cations for H^+ ions and conversion of insoluble alginates to soluble alginates by addition of sodium carbonate at a pH scale below 10 (Figure 10.3).