11.9 Environmental Effects on Alginate Packaging

The stability of alginate packaging strongly depends upon the environmental conditions to which the packages are subjected, i.e., pH, temperature, external pressure or humidity, and similar factors that are in its surroundings [99]. When there is an extreme change in the pH of alginate films, there is a reduction in the degree of polymerization.

Thermal stability of the alginate packaging is another important attribute that needs to be investigated while considering it as a packaging material for foods. This can be determined by laboratory techniques. Thermograms of alginate films show that the films will undergo thermal degradation at some point when temperature increases. These films start to lose their native property when temperature crosses 100°C, with major degradation occurring between 100°C and 200°C. During degradation, there is a cross-linking in the polymer linkages [19].

Surface wettability is another major disadvantage regarding biopolymer packaging. Surface wettability of alginate packaging can be determined by measuring the contact angle between the water drop and the surface film. This is to estimate the surface hydrophobicity of the films. The disadvantage from wettability commonly occurs in starch-based films, since they are hydrophilic in nature [19]. Sodium alginate is known to have higher hydrophobicity than starch, and when wet, alginate's surface free energy also increases. As the free energy on the surface increases, the contact angle also increases owing to modified hydrophobic properties [100]. So this explains the concern that increasing alginate content in starch-based films would render concerns about surface wettability of the package. Generally, with increasing alginate content in biofilms, intercellular gel matrix also increases, providing mechanical strength to the packaging. Alginate has been reported to be the material of choice for packing foods that are easily affected by gas penetration [17]. Cross-linking in alginate films is also important since films lacking the same dissolve and disintegrate in water. As a counter measure, water solubility of alginate films can be decreased by cross-linking with multivalent ions [36].

11.10 Market Outlook

Public acceptability to the use of biopolymers in food should also be considered. Educating the masses on beneficial effects and food safety aspects of