

11.6.5 Oxygen Permeability

Oxygen permeability is another important factor for the shelf life of food products, yet limited reports are available regarding oxygen permeability of biopolymer packaging. Moisture absorption and oxygen permeability are both parallel properties of packaging materials. Moisture absorption depends on the molecular size of the alginate film. Compared to other polymers, alginate packaging being a biopolymer is known to exhibit little elevated permeability to air. Chemical composition and structural differences of the polymers could also be the reason for this elevated permeability. Over a period of time, alginate packaging shows stable oxygen permeability, but the WVP was found to be decreasing [73–75].

11.6.6 Barrier Property

Rojas-Graü *et al.*, [12] reported that alginates exhibit good barrier property toward water molecules and found that 2% of alginate coating applied on fresh-cut “Fuji” apples was successful in avoiding water loss. In a separate study, Montero Calderón [76] observed that no off-flavors were developed in alginate-coated pineapple pieces. This study proves that there is no evidence for deterioration of the product due to retention of water inside the cut pieces. Sirviö *et al.*, [36] studied incorporation of additives having lesser permeability in alginate films. The authors observed an improved barrier property of the films.

For improvement of the barrier property of the packaging material, concentration of alginate coating is needed to be optimized prior to its application into the packaging system [17]. One major concern is to take care of the fragility of the alginate coating. Strength of the alginate in packaging application can be improved by increasing the weight of the molecules or length of the G-blocks. Increasing the M-blocks increases the flexibility and fragility of the films. Solubility of the alginates in acid depends upon its alternating divisions D-mannuronic acid and L-guluronic acid [77, 60]. Application of nano- and microsized cellulose to alginate films also renders strength to the material and thus decreases permeability of water molecule through the film [78].

11.6.7 Antimicrobial Activity

Appendini and Hotchkiss [79] have asserted the importance of maintaining the quality, safety, and freshness of food using various packaging technologies. According to the authors, this includes developing packaging