happens in the modification process, as otherwise controlled modification is difficult to achieve. The sensitivity of alginates with acidic, basic, and reductive environments is also important while performing the reaction. Unfavorable conditions could ultimately lead to lowering the molecular weight and poor functional performance of the alginates. The chemical modification can be classified into two categories, which include modification in hydroxyl group and modification in carbonyl group.

2.4.2 Oxidation

The oxidation reaction creates aldehyde groups on the alginate. The reactivity of aldehydes is disparate from the alcohols and carboxyl groups, which would help in the synthesis of novel alginate derivatives. Generally, the oxidation is performed in aqueous media using periodate as a reagent. The oxidation reaction at C-2 and C-3 positions of the uronic units of sodium alginate with sodium periodate is shown in Figure 2.1. The number of aldehyde groups introduced can be reduced by limiting the concentration of the oxidant. Oxidation of alginate could possibly decrease the stiffness of the polymer [13]. Tyramine can attach to oxidized alginate by reductive amination that improves the immobilization of peroxidase enzyme onto Ca-alginate beads [45].

2.4.3 Sulfation

Sulfated alginates can be used as anticoagulants due to their structural similarities to heparin. The chemical sulfation of polysaccharide reaction should be under control; otherwise, excess sulfation can occur, which leads to various side effects. In order to avoid oversulfation, quaternary amine groups are attached to the alginates. The decreasing anticoagulant activity is in direct proportion to the number of quaternary amine groups attached onto the alginates.

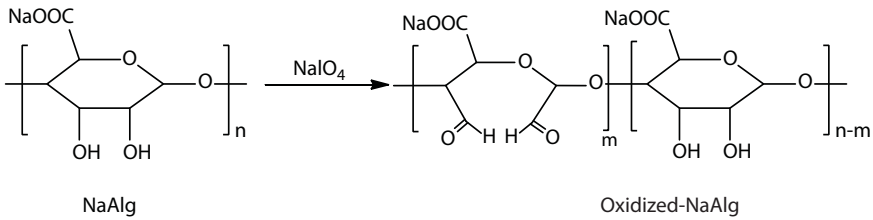

Figure 2.1 Oxidation of sodium alginate.