

Figure 2.3 Esterification of alginate.

esterification of sodium alginate with butanol, catalyzed by the presence of sulfuric acid. It showed nontoxic properties similar to its native alginate [49].

2.4.7 Carbodiimide Coupling

It is one of the popular methods to form amide groups by connecting the carboxyl group of alginates with amine functional substituents. The reaction is carried out in an aqueous system, and this reaction does not need harsh environments like high acid or base. It has been possible to achieve the reversal of predominant hydrophobic interactions between the alkyl chains by mixing β -cyclodextrin with hydrophobically modified alginates [50]. β -Cyclodextrin is highly hydrophobic in its interior and external entities also showed similar hydrophobicity so the small size compounds can be encapsulated within the β -cyclodextrin core. Carbodiimide coupling can achieve the grafting of polyglycolic acid (PGLA) onto the alginate backbone. It has been suggested that graft of PGLA alginate is feasible by direct condensation of alginate and glycolic acid by carbodiimide coupling reagent [51].

2.4.8 Covalent Cross-Linking

Figure 2.4 depicts the cross-linking of alginate using a covalent cross-linker, epichlorohydrin. The covalently cross-linked alginate was obtained by reacting calcium alginate gels with epichlorohydrin in the presence of base catalyst. The calcium ions may be exchanged with sodium ions without

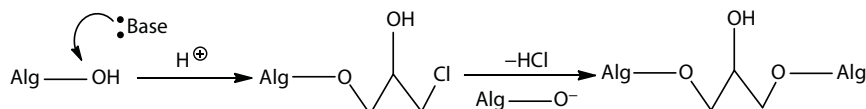


Figure 2.4 Alginate cross-linking using epichlorohydrin.