

Ingredients

### Alginate applications in the food industry

Biotec's Technical Department

Extraction of alginates from marine brown algae dates back to the late 18<sup>th</sup> century, but production gained prominence after the Second World War. The term 'alginate' refers to alginic acid and sodium and calcium salts. Alginates are linear copolymers of two monomers of  $\beta$ -D-mannuronic acid and  $\alpha$ -L-guluronic acid. These monomers can be found in the alginate molecules in the form of homopolymer blocks of guluronic acid (G blocks) and mannuronic acid (M blocks) or in alternating blocks (MG blocks).

The proportion of M blocks and G blocks varies according to the algae species, which enables a wide-ranging possibilities of functional properties for commercial alginates. Differences in the proportion of M and G blocks can be seen in the alginates' gelling properties: for example, larger numbers of G blocks lead to the formation of rigid gels with low water-binding capacity. However, elastic gels with reduced syneresis are formed from a larger number of M blocks.

The parallel alignment of two chains of G blocks gives rise to an egg, whose dimension can perfectly fit a calcium ion. This forms a structure known as 'egg box model'. It is the reactivity of calcium ions what provides such structure with thickening, stabilizing and gelifying properties. The extraction is performed through two different processes which involve different reaction intermediates: calcium alginate and alginic acid.

Last but not least, the recent years have witnessed an increase in the versatility of the alginate application in the food industry, due to the fact that low doses are used. The algal species involved in the process are responsible for the rigid or the highly elastic behaviors gels adopt, which are resistant to freezing and cooking, and can be hydrated in both hot and cold solutions.

Biotec Inc. is currently designing tailor-made formulations using pure alginates extracted from different types of algae in order to be able to offer a wide range of products with different features and improve our client's satisfaction. These blends can be found in many different options, such as dairy and restructured meat and vegetable products, cream fillings, ice-cream, etc.

### Chemical structures of alginate monomers



