STUDY OF THE DEHYDRATION OF AN AQUEOUS SOLUTION OF MALTOTRIOSE BY THE IR-FOURIER SPECTROSCOPY

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ABSTRACT

In this paper, the changes in IR-Fourier spectra of aqueous maltotriose solution taking place during its dehydration have been analyzed. It is established that in the solution there is a reciprocal effect of the components at the level of the chemical bonds and molecules, the value of which depends on the water/carbohydrate ratio. As compared with maltotriose, the dehydration product of its solution contains more tightly bound water, which possibly "stitches" individual molecules of trisaccharide by binding to their α-glycoside bridges. Individual oligosaccharides with a number of pyranose cycles in the molecules 3 - 7 behave like maltotriose.

Keywords: IR-Fourier spectrum, carbohydrate, saccharide, trisaccharide, maltotriose, dehydration.

INTRODUCTION

The concept of carbohydrates has penetrated deeply into the life and human activity, as carbohydrates are a part of a variety of products, such as adhesives, glues, medical and pharmaceutical preparations. Trisaccharide molecules consist of three monosaccharide residues linked together by the interaction of hydroxyl groups. The general formula for trisaccharides is generally $C_{18}H_{36}O_{18}$. Trisaccharides can differ from one to another in the structure of their monosaccharides and their sequence in the chain, the size of the cycles (five-membered furanose or six-membered pyranose), the configuration of glycosidic centers and glycosyl residues to the aglycons. This causes tens of thousands of possible trisaccharide isomers. The monosaccharides also include raffinose, consisting of residues of D-galactose, D-glucose and D-fructose; melicitose, which consists of two residues of D-glucose and one residue of D-fructose. Maltotriose is also one of the known trisaccharides, consists of three residues of D-glucose [1, 2].

Of particular interest are solutions of carbohydrates in water, since it is in this form that many of the saccharides are used for their intended purpose or as precursors (raw materials, semi-products) in the preparation of products from them. The structure of aqueous solutions of carbohydrates is devoted to a significant number of spectroscopic studies, most of which consider substances with a simple molecular structure, for example, mono- and disaccharides [3 - 5], or, conversely, highly polymerized starches and dextrins [6 - 9]. There have also been published papers on the nature of intermediate forms of carbohydrates [10 - 13], but they almost did not touch upon the relationship of properties with the degree of polymerization of substances.

The aim of the work was to analyze the changes in the IR-Fourier spectra of an aqueous solution of maltotriose occurring during its dehydration. In this paper, using the method of IR Fourier spectroscopy, has been considered the dehydration of an aqueous solution of maltotriose, the molecule of which is constructed from identical pyranose rings connected by the same α-glycosidic chemical bonds.