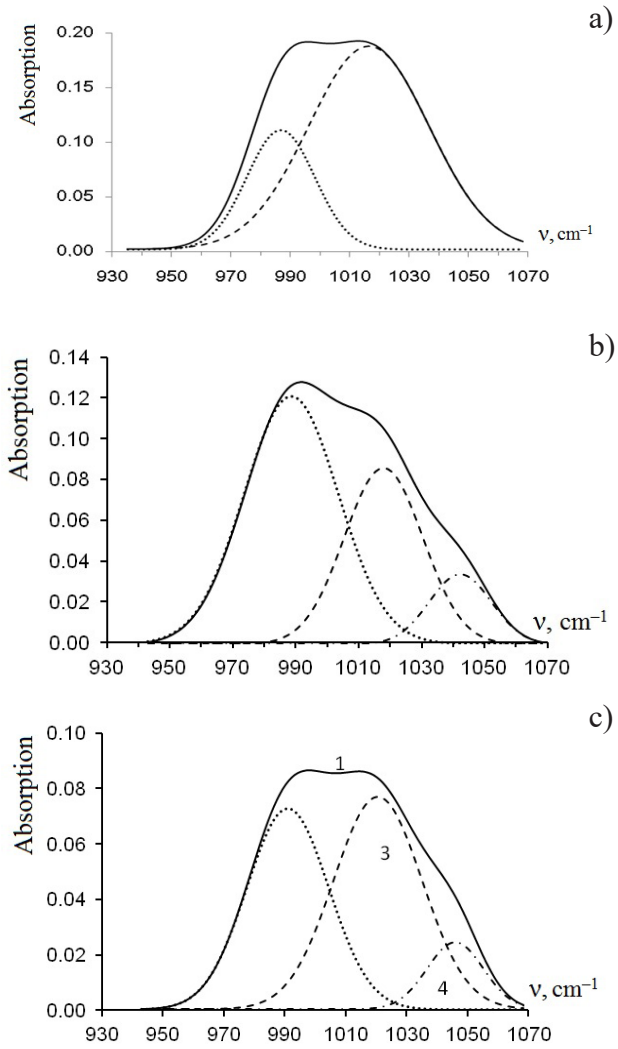

Fig. 3. The structure of the dominant lines in the IR spectra of maltotetraose (a), amylose (b) and amylopectin (c): 1 - the profile of the experimental spectral line, 2-4 - its constituent components.

bridges due to an increase or a decrease of the length of the molecular chains (a degree of polymerization) can appear in the IR spectra in the form of a smooth and distinct redistribution of the position and the magnitude of the individual lines referring to the bond type. Such a practical approach provides to follow more accurately the evolution of the desired chemical bonds, since it eliminates the jump-like factor and the hardly predicted changes of the corresponding spectral lines. The infrared spectra of oligosaccharides differ from those of glucose and maltose by the significantly lower resolution of the bands recorded in the range of 960 cm^{-1} - 1060 cm^{-1}

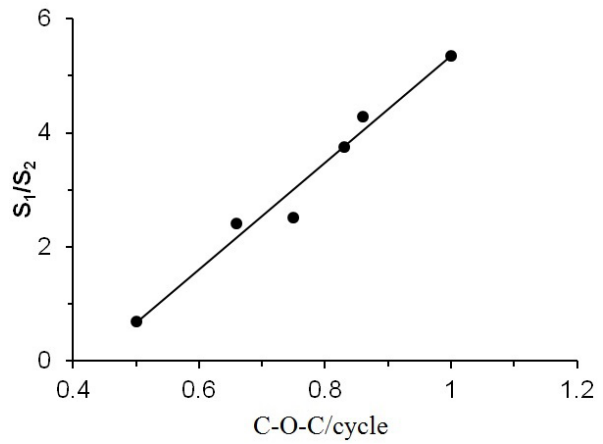

Fig. 4. Relationship between the relative area S_1 and S_2 of the calculated spectral peaks with maxima of 986 cm^{-1} - 988 cm^{-1} and 1,013 cm^{-1} - 1,017 cm^{-1} and the share of glycosidic bonds in molecules of oligosaccharides.

(Fig. 2), whose profile differs somewhat. This is especially valid for the most intensive of them. The spectral bands outside the range specified are identical for all carbohydrates. The spectrum of maltose in this range is almost identical to that of oligosaccharides, but only after a significant smoothing.

The results of the graphical analysis show that the bands of all oligosaccharides studied in the range of 960 cm^{-1} - 1060 cm^{-1} consist of low and high frequency components, as shown in Fig. 3 using the maltotetraose spectrum as an example. The position of each component in the spectrum is almost independent of the oligosaccharide type: in fact, their peaks are not recorded beyond 986 cm^{-1} - 988 cm^{-1} and 1013 cm^{-1} - 1017 cm^{-1}. The situation referring to the size of the calculated components is different: the increase of the chain length of the carbohydrate and the glycosidic bonds proportion leads to an increase of the lower frequency, and a higher frequency decrease. This is illustrated by the linear increase of the ratio of the magnitude of the components in the form of areas S_1 and S_2 (Fig. 4).

If the spectral lines comparison considered in refs. [3, 16] is accepted, then it can be assumed that the low-frequency component exhibits $\alpha(1 \rightarrow 4)$ bonds vibrations. In this case, the intensity of the calculated peak could be used as a criterion of the content of C-O-C bridging bonds or as a measure of the degree of polymerization of the carbohydrates studied.

The estimation does not require the peak itself, but