

Synthesis, structure and properties of polyaldehyde dextran

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Dialdehyde dextran is being actively studied as a potential carrier of biologically active substances due to its biocompatibility and ability to prolong the action of low molecular weight substances.

The purpose of this work is to obtain polyaldehyde dextran by oxidation of dextran with a sodium periodate aqueous solution, to study the structure and physicochemical properties.

The effects of the NaIO_4 : glucopyranose units (GPU) molar ratio, solution pH (2,6 - 6,9), duration reaction (5 – 180 min) and reaction temperature (0 – 30 °C) on the composition, the homogeneity of substitution and the rate of dissolution of oxidized dextran were studied. It was found that as the molar ratio increased (more than 10%), the limiting oxidation degree of dextran increased and hemiacetals formed; also, the parallel reaction of dextran oxidation occurred with the release of formic acid, i.e. a polymer is formed containing three types of oxidized units (Figure)

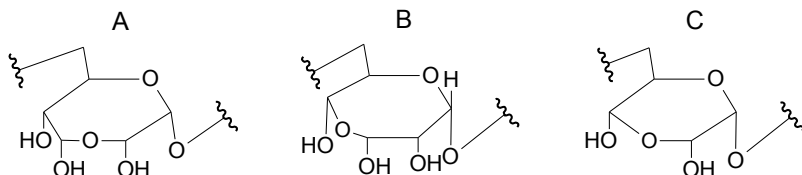


Fig. Supposed structures of oxidized units

The presence of structures in dialdehyde dextran under the indicated reaction conditions is confirmed by IR spectroscopy data.

Table. Reaction conditions and composition of oxidized dextran depending on the content of sodium periodate in an aqueous solution (T 20 °C, t 1,0 h, pH 2,67)

Molar ratio of NaIO_4 : GPU	OD	Number of oxidized units		M_w , Da
		2,4	3,4 and 2,3	
0,10	8	0	8	62900
0,20	15	6	9	58700
0,48	41	14	27	47300

Note. The oxidation degree (OD) is the total number of oxidized units per 100 GPU of dextran.

As a result of studying the regularities of the oxidation reaction, the optimal conditions for obtaining the most homogeneous on composition samples of dialdehyde dextran with the oxidation degree in the range of 20–50 were determined: molar ratio 20–50; temperature 20 °C; reaction time 1 hour.