

EFFECT OF pH ON THE RHEOLOGICAL PROPERTIES OF CARRAGEENAN «PZF» SOLUTIONS

Ferens A. S., Sumska O. P.

Kherson State Agrarian and Economic University, Kropyvnytskyi, Ukraine
annaferens24@gmail.com, sumskaetdt@gmail.com

The practical application of carrageenan is largely determined by its physicochemical properties, in particular rheological, which are different for different types of carrageenan. Experimental studies have been conducted on the use of phytocolloid - carrageenan *Phyllophora* (Zerniv deposit), extracted from the Black Sea red algae *Phyllophora Brodyas*.

Characteristics of carrageenan «PZF»: Moisture – 11 %, mass fraction of ash – 25.5 %. The content of 3,6-anhydrogalactose is 21.3 %, the mass fraction of sulfoester groups (in terms of SO₄) is 24.2 %.

The rotary viscometer Rheotest-2 (Germany) was used to determine the viscosity of Newtonian liquids and conduct rheological studies of non-Newtonian systems. Measuring node – coaxial cylinders. The range of changing shear rate gradient is from 3 to 1312 s⁻¹. The temperature of the measuring unit was kept with an accuracy of 0.1 °C.

The dependence of viscosity on the shear rate was calculated using the computer program "Tehiya".

One of the main physico-chemical indicators determining the course of the technological process is pH. Hydrogen indicator pH is a value that shows the degree of activity of hydrogen ions (H⁺) in a solution, that is, the degree of acidity or alkalinity of this solution. This characteristic determines the structure formation in the finished product, as well as its storage terms.

The pH of the solutions was determined according to the standard procedure.

To determine the pH, 100 g of a 1 % suspension of the carrageenan preparation in distilled water was prepared. The suspension is dispersed for 15 min at room temperature and the pH is determined on a pH meter pre-calibrated with standard buffers.

The results of the study are shown in the table.

Table. Effect of pH on the rheological properties of carrageenan «PZF» solutions 4 %

| Properties | pH | | | | | | |
|----------------------------|------|------|------|------|------|------|------|
| | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Viscosity, Pa·s | 0,33 | 0,32 | 0,29 | 0,28 | 0,27 | 0,27 | 0,25 |
| Flow index | 0,35 | 0,40 | 0,40 | 0,42 | 0,40 | 0,38 | 0,30 |
| Activation entropy, kJ/mol | 0,20 | 0,55 | 2,85 | 3,15 | 3,19 | 2,95 | 2,10 |

With increasing acidity of the environment, the viscosity of solutions based on carrageenan «PZF» increases significantly. Specific features of the rheological behavior of carrageenan-based solutions with changes in pH are clearly traced when considering the dependences of the activation entropy and flow index. The flow index and the activation entropy of a carrageenan solution under the influence of pH change insignificantly when moving from an acidic to an alkaline environment. One of the criteria for the suitability of a high-molecular compound as a thickener is the pH range within which the given preparation retains its consumer properties. It has been established that carrageenan «PZF» solutions retain their inherent anamnesis-viscous properties in a wide pH range. When the pH of solutions changes from 4 to 10, no signs of conformational transition of carrageenan macromolecules are detected.