

PR-12. FORMATION REGULARITIES OF SILICON-POLYSACCARIDE-CONTAINING POLYOLATE HYDROGELS

M. E. Novoselova¹, M. V. Ivanenko², E. Yu. Nikitina², T. G. Khonina²

¹Ural Federal University of the first President of Russia B. N. Yeltsin,
Mira St., 19, Yekaterinburg, 620002, Russia

²I. Ya. Postovsky Institute of Organic Synthesis UB RAS,
S. Kovalevskoy/Akademicheskaya St., 20/22, Yekaterinburg, 620990, Russia

E-mail: mariika1995nov@mail.ru

Earlier we have synthesized new hybrid silicon-glycerol-chitosan hydrogels by biomimetic sol-gel method using silicon tetraglycerolate and combined silicon dimethyl- and tetraglycerolates as precursors and chitosan as template and properties modifier [1–3]. The *in vivo* test showed that these gels are non-toxic. It was also shown that hydrogels possess pronounced hemostatic, antimicrobial, wound-healing, and anti-inflammatory effects, and can be used as both independent drugs for topical application, and the bases of pharmaceutical formulations with additives of drugs [4]. In continuation of these studies, along with silicon glycerolates and chitosan, silicon (poly)ethylene glycolate [5] as new precursor, and a number of polysaccharides (carboxymethyl cellulose, xanthan gum, and hydroxyethyl cellulose) were investigated. Precursor solutions in polyol: silicon tetraglycerolate ($\text{Si}(\text{OCH}_2\text{CH}(\text{OH})\text{CH}_2\text{OH})_4$ – glycerol = 1 : 3), combined silicon dimethyl- and tetraglycerolates ($\text{Me}_2\text{Si}(\text{OCH}_2\text{CH}(\text{OH})\text{CH}_2\text{OH})_2$ – $\text{Si}(\text{OCH}_2\text{CH}(\text{OH})\text{CH}_2\text{OH})_4$ – glycerol = 0,5 : 1 : 3), silicon tetra(poly)ethylene glycolate ($\text{Si}(\text{O}(\text{CH}_2\text{CHO})_9\text{H})_4$ – (poly)ethylene glycol = 1 : 0–1), and also 0,1–3,0 % solutions of polysaccharides were used. The effect of the molar ratio of the starting materials – silicon polyolate : polyol : polysaccharide (unit) : water, on the gelation process was determined. It was shown that the addition of all the polysaccharides studied significantly accelerates gelation. The gelation time decreases with increasing of polysaccharide content in the system in the case of silicon glycerolates. The shortest gelation time is achieved even at a polysaccharide concentration of ~ 0,5 %. In the case of silicon (poly)ethylene glycolate, the gelation time remains almost constant over a wide range of concentrations of polysaccharides in solution.

Using scanning electron microscopy in the cryo mode, it has been found that the main morphological element in all hydrogels is a network formed by polysaccharide macromolecules that, in our opinion, are intermolecularly bonded, including hydrogen bonds, to hydroxyl groups of a silicon-containing polymer network.

The solid phases of the investigated silicon-polysaccharide-containing hydrogels were isolated by exhaustive cold extraction with absolute ethyl alcohol and then characterized. The polymer type of gelation was shown.

References

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This work was carried out in the framework of the state assignment of FASO of Russia (theme № AAAA-A18-118020290116-5).