Influence of the dimethylsulfoxide-water mixtures on the properties of poly(vinyl alcohol) cryogels.

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Introduction.

Poly(vinyl alcohol) (PVA) cryogels are the noncovalent macroporous gels formed as a result of freeze-thaw processing of concentrated PVA solutions. Such cryogels are widely used as biomedical materials due to their mechanical durability, biocompatibility and also viscoelastic properties similar to those of soft biological tissues. In clinical practice PVA cryogels have been applied as functional materials like the wound dressings, artificial skin, cardiovascular devices, drug delivery matrices, spine disc replacements, etc.

In some cases, the application of PVA cryogels is limited by the yet insufficient rigidity of these materials. There are several ways to increase the physico-mechanical properties of PVA cryogels: e.g., by raising the polymer concentration in initial solution, by inserting of kosmotropes additives, by performing of additional "freezing-thawing" cycles. We suggested another decision for increasing the elasticity of PVA cryogels.

Methods.

PVA cryogels were prepared by the "freezing-thawing" method originating from the 100 g/L aqueous solutions of this polymer. The resultant samples were than saturated with the solutions of dimethyl sulfoxide-water mixtures of different ratio, and the Young's modulus and fusion temperature values of the cryogel samples were evaluated.

Results.

It was shown that the values of E modulus raise with an increase in DMSO content in mixed solutions. With that the maximum of E values and fusion temperature of samples is observed for the samples saturated with the 1:1 DMSO-water mixture. In this case the E modulus increased by 30 times comparing to the PVA cryogel prepared from the water polymer solution. After rinsing the "saturated" cryogels with pure water their values of E modulus fall not critically so the high rigidity of PVA cryogels was saved. The macroporous morphology of the resultant materials was also evaluated.

Conclusion

We suppose that these materials based on PVA cryogels could be of interest in different areas of application.