METHODS OF PREPARATION OF POLYMERIC MICROCAPSULES-SHELLS FOR LASER TARGETS OF INERTIAL CONFINEMENT FUSION [[1]](#footnote-1)\*)

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The use of hollow polymer shells is promising for the manufacture of targets for inertial confinement fusion [1-4]. In this work, the material for such shells was poly-alpha-methylstyrene synthesized by cationic polymerization at a temperature of -70 - 90 °C. It was found by gel permeation chromatography that the obtained polymer samples have a broad molecular weight distribution from 104 to 106 with a maximum from 3\*105 to 4.5\*105. Hollow polymer shells have been prepared by microencapsulation in several technical versions of this method using vertical and horizontal rotary mixing methods. Shell microcapsules formed from a polymer solution using a dropper with three coaxial tubes were introduced into a water-salt medium with a surfactant - a stabilizer for the dispersion of shells in a liquid state. Fluorobenzene, mixtures of dichloroethane with benzene, and tetrachloroethane with ortho-xylene were used as solvents for the polymer, and solutions of polyvinyl alcohol with ammonium nitrate were used as the aqueous phase. Liquid microcapsules-shells, after removing the solvent upon heating in certain temperature-time regimes, without losing their shape, passed into a solid state. The shells obtained under optimal conditions after thermal removal of internal water had a good spherical shape with a maximum deviation of 0.5% from the average value of the sphere diameter and a deviation of 2% from the average diameter of 2150 μm for a group of 100 hollow shells.

References

1. Meifang Liu, Sufen Chen, Xiao bo Qi, Bo Li, Ruiting Shi, Yiyang Liu, Yongping Chen, Zhanwen Zhang. Improvement of wall thickness uniformity of thick-walled polystyrene shells by density matching / Chemical Engineering Journal. 2014. V.241. P.466-476.
2. Xiuyun Shangguan, Sufen Chen, Shuang Ma, Meifang Liu, Changhuan Tang, Yong Yi, Zhanwen Zhang. Effect of molecular weight on the quality of poly(alpha-methylstyrene) mandrel / Matter and Radiation at Extremes. 2017. V.2. P.197-203.
3. Meifang Liu, YawenHuang, Sufen Chen, Dawei Pan, Miao Chen, Qiaomei Chu, Yiyang Liu, Qiang Yin, Zhanwen Zhang. Progress and challenges in the fabrication of DPS shells for ICF / Matter and Radiation at Extremes. 2019. V.4. 018401.
4. Pastukhov A.V., Davankov V.A., Akunets A.A., Borisenko N.G., Orekhov A.S., Tolokonnikov S.M., Pervakov K.S. Hollow Poly(alpha-methyl-styrene) Shells for Inertial Confinement Fusion Targets / Journal of Physics: Conference Series. 2017. V.907. N1. 012020.
1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVIII/It/ru/DJ-Pastuhov.docx) [↑](#footnote-ref-1)