RF PLASMA MODIFICATION OF GLASS FIBER UNDER DYNAMIC VACUUM [[1]](#footnote-1)\*)

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RF plasma with gas flow at low pressure range of 13.3-133 Pa (which is called as “dynamic vacuum”) is a promising area of practical application for the cleaning of materials from contamination [1, 2].

Special technical coatings (lubricants or gloss finish) are applied to improve the adhesion of the glass fiber surface with polymers in polymer composite materials and fiberglass (gloss finish) and protect elementary fibers and threads from abrasion, the formation of microcracks and their destruction during processing (textile size). Textile size is needed to remove from the surface after the fiberglass production to increase the adhesion of the filler to the polymer matrix.

RF discharges under dynamic vacuum is a dry and environmentally friendly process that does not use toxic chemical reagents, so the study of cleaning glass fabric from textile size is highly topical issue.

To evaluate the plasma effect on the textile size, the Monte Carlo simulation of low-energy ion bombardment (70–100 eV) of the glass fabric surface was performed. The initial data for modeling were the composition of the argon plasma and the molecular weight distribution of the textile size components.

As a result of modeling, it was found that the effect of plasma treatment leads to a change in the fractional composition of the textile size with the formation of gaseous and light-boiling fractions. The removal of gaseous and low-boiling fractions leads to a change in the molecular weight distribution of the textile size components.

Comparison of the simulation results with the results of experimental studies shows that the physical ion impact during plasma treatment of glass fabric plays a major role while the chemical impact of plasma is much less important.

References

1. Abdullin I.Sh., Zheltukhin V.S., Kashapov N.F. (2000) Radio-frequency plasma-jet processing of materials at reduced pressures. Theory and practice of application. Kazan: Kazan Univ. Publ. House. [Vysokochastotnaya plazmenno-struynaya obrabotka materialov pri ponizhennykh davleniyakh. Teoriya i praktika primeneniya. Kazan': Izd-vo Kazanskogo un-ta – in Russian].
2. Azanova A.A. et al. // Bulletin of the Russian Academy of Sciences: Physics, 2018, Vol. 82, No. 2, pp. 189–192.
1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/L/Pt/ru/HH-Ershov.docx) [↑](#footnote-ref-1)