Renovation of Educational Programs for "Technology and Design of Packaging Production" Specialization as a Result of Student Scientific Activities

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Recently, owing to rapid development of industry for vivid-colour packaging products made of polymeric materials, printing based on polymeric films used as a sort of sealed material has become more and more widespread.

The existing educational programs in Russia for "Technology and design of packaging production" specialization place main accent directly on printing processes with use of polymeric films, that is interaction on the cross-border between the printing ink and polymeric film surface. However, little attention has been given to the peculiarities of the sealed material. After having experienced the tape-feed roll paths of polygraphic equipment, the polymeric film is affected by temperature and mechanical fields, as well as triboelectrization and other stresses. In the best case possible, we have knowledge of the values for the physical and mechanical properties of the polymeric films, such as tensile strength and failure percent elongation. However, it is quite obvious, that such values of mechanical stresses and deformations are not encountered with both in real technological printing and packaging processes, and while operating the technological equipment.

When developing new processes associated with printing on polymeric films, it is necessary to define limiting constraints for their application in various polygraphic processes.

Unlike the conventionally used sealing material, paper, polymeric films processes have special physical and mechanical surface properties which will substantially affect both print quality and the printing process itself, especially movement of the film along the tape-feed roll path of the polygraphic equipment.

We offer additional researches for receiving more detailed information.

1. Analyzing functional dependency $\varepsilon=f(\sigma)$, where (σ) - tensile strength, (ε) - failure percent elongation. Processing of the results of BOPP films revealed the limit levels of tensile stresses at which deformation was recoverable.
2. Examination of stress relaxation in BOPP films.

For the purpose of this work some methods for studying relaxation and physical and mechanical properties of the polymeric films under conditions of small deformations used as packaging material were explored. The developed approach allows us to predict the behaviour of the polymeric films as early as the manufacturing stage and their suitability for modern packaging applications, as well as to specify limiting constraints on application of mechanical loads in printing or packaging equipment.

In addition, it is worth noting that programmes for disciplines covering "Technology and design of packing production" specialization should be augmented with information on methods targeting creation of the so-called smart packaging. This would involve application of polygraphic methods for imprinting thin polymeric films, equipped with temperature indicators, gas mixture inside the packaging and other changes in conditions, into the internal surface of the packing material. It goes without saying that there is every reason to introduce elements of nanotechnologies for packaging industry into educational program.

Summary

The scientists of MSUPA performed a number of experimental works on modification of surfaces of PE and BOPP polymeric films. The thickness of the modified layers was between 10–20 nanometers. Moisture permeability for such films was decreased by 5-6 times, and by 4 times for oxygen. After implementation of this technology of polymeric film surface modification the technology of imprinting special thicker layers, ensuring required barrier properties, may be safely eliminated.

The results of the conducted researches demonstrated the availability of experimental and theoretical basis for making corrections and amendments into educational program on "Technology and design of packing production" specialization.

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