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Evaluation the supramolecular structure bicomponent fibers for preparation of filters for efficient reduction of hazardous substances in the processes of surface treatment of wood

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Abstract: *Evaluation the supramolecular structure bicomponent fibers for preparation of filters for efficient reduction of hazardous substances in the processes of surface treatment of wood.* The paper deals with the evaluation of experimental design and ready-mixed bi-component fibers for the preparation of high-efficiency filters to separation equipment for the preparation of the filters applied in these facilities to reduce, respectively elimination of hazardous substances in surface pretreatment processes and finishes of wood materials. New types of experimentally prepared bi-component fibers extended range fiber-forming synthetic materials for application in innovative filters, installed in separation equipment for the elimination of hazardous and dangerous chemicals and aeroólov generated by the pre-treatment processes and, consequently, surface treatment of wood materials.

Keywords: hazardous substances surface treatment, wood, air polution, coatings, bicomponent fibers, filters

INTRODUCTION

Monitoring of hazardous gaseous and particulate pollutants is one of the measures to monitor the quality of work and living environment just interact with the materials used for the interior decoration of these spaces. One of the solutions that combine the preparation of new materials, innovation in technology training environmentally friendly materials, which would reduce, respectively. total replacement of the components that classified materials in many positions hygienically problematic, given the presence of dangerous chemicals.

The majority source generating the emergence of hazardous substances in the air are the processes of surface treatment materials based on metals, wood, plastics, further degreasing and electrolytic plating materials and processes using solvents, varnishes, inks and adhesives, which involve the release of emission of volatile organic compounds.

In the preparation of wood products physical and chemical factors of the working environment are taken into account, in relation to the risks to production workers. In the preparation of wood products physical and chemical factors of the working environment are taken into account, in relation to the risks to production workers. Chemical environmental factors are judged primarily by the presence of chemical substances (hazardous, respectively dangerous) and compared with legislatively defined concentration limits.

Various alternative methods of dispute eco-efficient detection of hazardous substances in the atmosphere have been published in the works of authors (RUŽINSKÁ & JABŁOŃSKI, 2012). The paper deals with the evaluation of experimental design and ready-mixed bi-component fibers for the preparation of high-efficiency filters to separation equipment for the preparation of the filters applied in these facilities to reduce, respectively. elimination of hazardous substances in surface pretreatment processes and finishes of wood materials.

EVALUATION OF MORPHOLOGICAL CHARACTERISTICS BICOMPONENT FIBERS FOR APPLICATIONS IN FILTERS

Bicomponent synthetic fibers are a group of advanced materials that have recently expanded range of conventional fiber-forming polymers, not only in various industrial, but

also in construction applications, e.g. as innovative soundproofing, particularly filter materials and they are applicable in the elimination of hazardous substances in air, in industrial technology and also in the wood processing industry - to install separation equipments at the facilities of surface treatment of wood (RUŽINSKÁ & JABLOŃSKI, 2011).

MATERIAL

In order to study the impact of the ratio of ingredients and contents of interfacial agent to prepare a series of fiber-forming polymer mixtures (published in thesis authors RUŽINSKÁ & JABLOŃSKI, 2011).:

a) and / mixtures with different ratio of the components of polypropylene and polyamide 6 Mixtures prepared without interfacial agent was defined PP/PA6 a mixture prepared by mixing polypropylene with polyamide 6, adjusted 4% copolymer PP-MAH, we identified PP/PA6M. Prepare the following mixture:PP/PA6 90/10 and 80/20, PP/PA6M 90/10, 80/20,70/30, 60/40, 50/50, 60/40, 20/80
b) Mixtures containing various interfacial agents at a constant ratio of the components (80/20). The following mixtures were prepared PP/PA6/M: from 1 to 5% wt.

METHOD – SALS

Small angle scattering of visible light (SALS technique) was used to monitor the supramolecular arrangement of fibers. Was used as a source of He - Ne laser TKG 203 (λ = 0.633 nm) and beam diameter of about 2 mm. Samples of fibers were observed in the form of beams mounted between the cover glass slides, overlaid with immersion liquid.

The morphological structure of experimentally prepared bicomponent fiber blends was evaluated using SALS method - provides data about the nature, regularity and orderliness of supramolecular and morphological object structure. SALS microphotographies of prepared composite fibers are in Figure 1.

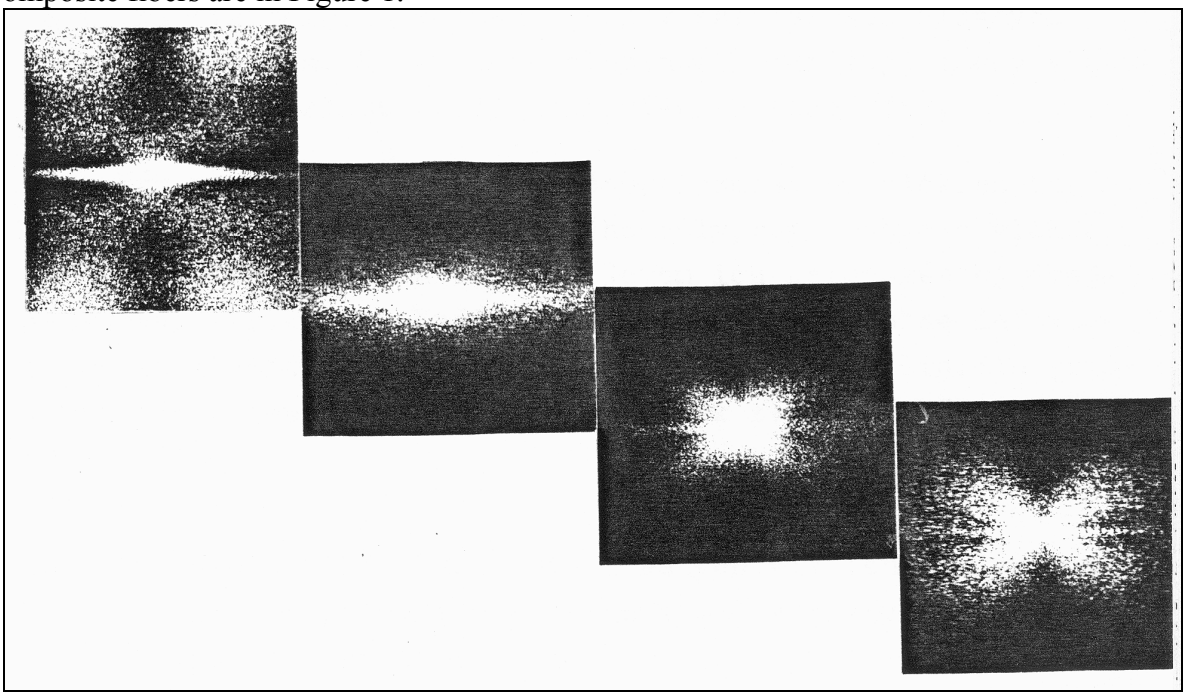

Fig. 1 SALS microscopic evaluation phase structure of non-drawn polypropylene blended fibers and those incorporating slides:
a) PP TI-902, b) PP/PA6/M 80/20/0, c) PP/PA6/M 80/19/1, d) PP/PA6/M 80/18/2

METHOD – MERCURY POROSIMETRY

To the study of preparing bicomponent fibers, as well as the evaluation of morphological structures, rheological characteristics and performance were dedicated comments from (RUŽINSKÁ & JABLOŃSKI, 2011).

Porosimetry was evaluated on the unit CARLO EBRBA type 1520. Substance mercury porosimeter measurement is to monitor the loss of mercury in the container from which the mercury pressure forced through the pores of the IMP treated for removing reduced temperature. Loss of mercury is most commonly determined from the change in electrical resistance wire submerged in a container. If the solid porous adsorbent immersed in a liquid which does not wet it, the liquid may penetrate into the pores only by the action of external pressure.

Pressure between the size and the smallest radius of the pore at this pressure has filled relationship applies:

$$g\,h\,\rho = P = -\frac{\gamma^{2}\cos\vartheta}{r} \qquad (1)$$

where:

g je gravitional acceleration,
ρ - the density of mercury,
h - mercury column height in the pore,
r - pore radius of the circular cross-section,
γ - surface tension of mercury in pore,
ϑ - pore mercury contact angle, P - total pressure.

Any increase in pressure causes the mercury enters the next smaller fraction of the pore radius, so that a gradual increase in pressure and current measurement of the volume of mercury forced into the pores can be detected pore volume distribution by size in a given adsorbent. Results can be obtained either by an integral (cumulative curve) or to illustrate the differential form (distribution curve).

RESULTS

The separation of ingredients of blended fibers was used not only to assess the phase structure, but also for the preparation of microfibres of polyamide 6. Due to the fact that materials prepared on the basis of microfibres are used not only as a filter materials, but also for sound-insulating purposes, we were interested in evaluating the specific surface of planar structures, as the major quality criterion for their industrial application.

Using the method of mercury porosimetry, based on extruding mercury through the pores in the observed material, we evaluated the size of the specific surface area and pore distribution in a constant volume of fibers. We compared the sample prepared from mixed bicomponent fibers PP/PA_{6M} 60/40 with a sample of polyamide microfibres obtained by extraction of mixed fiber, a comparison standard was sample of unmodified PP fiber. The experimental measurements were evaluated on the porozimeter CARLO ERBA device, type 1520.

Tab. 1 Measured and evaluated values of specific surface of prepared bicomponent fibers

Sample	**The specific surface (m^2/g)**
PP – pure polypropylene fibers	4,68
PP/PA6M 60/40 – modified bicomponent fibers	4,91
separated microfibers	**30,91**

From the results in Table 1. it is clear that in pure polypropylene as well as in a mixed bicomponent fiber occur pores in a relatively narrow distribution virtually to the size of 50 nm. These pores were created as an expression of structural defects of fiber surface. This is related to the low value of the specific fiber surface 4.91 m^2/g. For efficient capturing of PM it is appropriate to use the separated microfibers made from bicomponent fibers and process them into filters.

In the picture Figure 2. we can see rating distribution of pore-pressure mercury porosimetry method for the separated microfibres (value of the specific fiber surface 30,91 m^2/g).

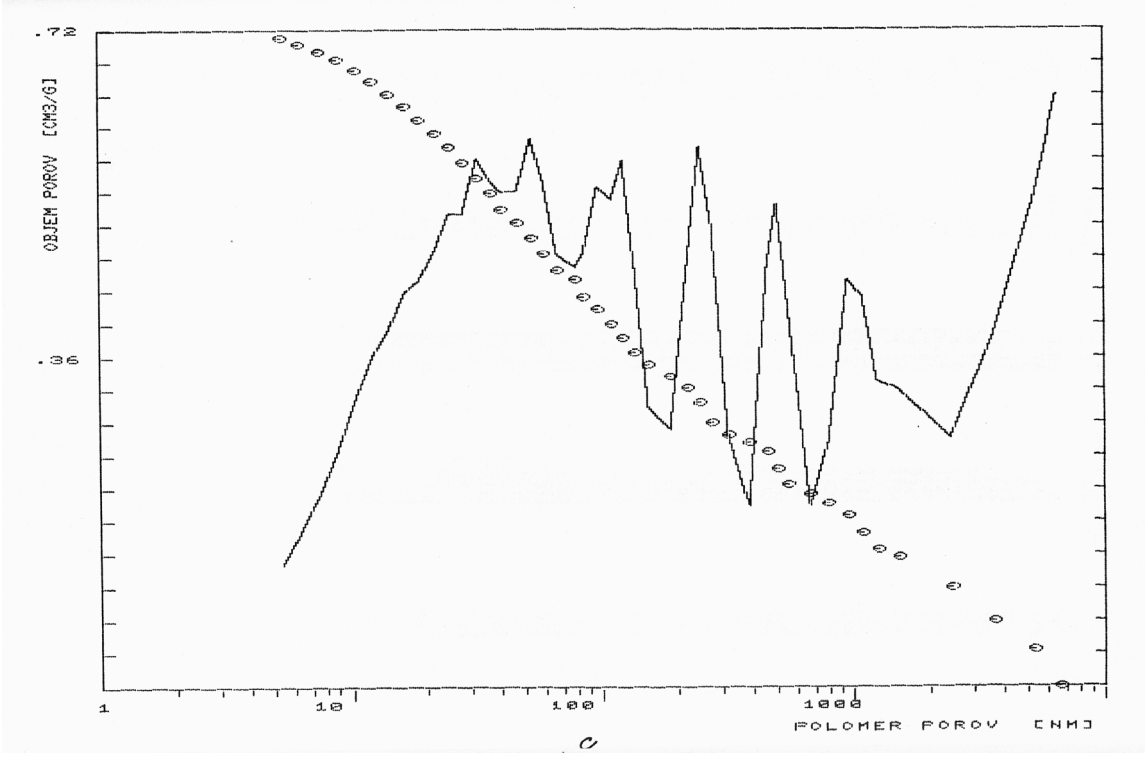

Fig. 2 Rating distribution of pore-pressure mercury porosimetry method for the separated microfibres (dependence of the pore volume in cm^3/g of pore radius in nanometers)

CONCLUSION

The evaluation of the structure of mixed fibers can be concluded that polyamide phase acts as a nucleating agent. Composite fibers have a higher proportion than non-modified crystalline polypropylene and polyamide fiber component increases the overall predorientáciu non-drawn fibers. Composite fibers prepared with an intermediate phase are characteristic of the type of matrix structure - fibrils. The mesophase content is higher, the microfibers are finer with more uniform distribution. Evaluation of morphological structures of polymers SALS method confirmed that the addition of the polyamide 6 suppresses the formation of spherulites. The addition of interfacial agent improves the degree of dispersion and adhesion at the phase interface and thus prevents the formation of pores.

New types of experimentally prepared bi-component fibers extended range fiber-forming synthetic materials for application in innovative filters, installed in separation equipment for the elimination of hazardous and dangerous chemicals and aeroólov generated by the pre-treatment processes and, consequently, surface treatment of wood materials. It is believed their high efficiency and long life in aggressive and corrosive environments in the surface treatments.

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Streszczenie*: Ocena struktury supramolekulatnej dwukomponentowych włókien do filtrów do efektywnej resukcji substancji szkodliwych powstających w procesie uszlachetniania powierzchni drewna*. Praca dotyczy oceny projektu ekeperymentalnych dwukomponentowych włókien służących do budowy wysokowydajnnych filtrów do redukcji substancji szkodliwych powstających w procesie uszlachetniania powierzchni drewna.

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