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IR-SPECTAL ANALYSIS OF ORGANIC PLASTICS BASED ON POLYTETRAFLUOROETHYLENE

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Summary. Today, composite materials based on polymer, reinforced by organic fibers in terms of production exceed steel, aluminum, cast iron and plastics due to their unique properties: high chemical resistance, low density (they are easier than carbon fiber and fiberglass), ability to long-term accumulation of damage in the volume of the detail without formation of critical cracks. Great application find organoplastics based on the heat-resistant thermoplastic binders, one of the promising representatives of which are fluoropolymers, including polytetrafluoroethylene (fluoroplast-4), which is well-known for its exceptional resistance to the aggressive environments (alkalis, acids, petroleum products, organic and inorganic solvents), wide temperature range of the operation (4–533 K), low coefficient of friction and natural lubricity. Taking into account the foregoing, the development of new organoplastics, that are able to work in difficult conditions (at high loads and temperatures, under the effect of aggressive environments), including based on fluoropolymers, with improved operational characteristics is an urgent task for modern material science. In this article are given infrared spectra of organoplastics based on polytetrafluoroethylene, reinforced by polysulfonamide fiber brand Tanlon T700. It has been established, that with the addition of 5–20 wt.% exist interaction of chemical and physical nature between the components of the developed organoplastics. From the obtained data, it should be noted, that the greatest chemical interaction, both from the side of polytetrafluoroethylene and from the Tanlon fiber, is observed for the composite material, containing 20 wt.% of filler, while the given organoplastic is chemically unstable, because it contains new multiple bonds (cumulative, double, triple), as well as in it arise new H-bonds of interpolymeric character.

Key words: organoplastics, polytetrafluoroethylene, fiber, Tanlon, IR-spectral analysis.

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Introduction. In recent years, intensive studies on the development of new synthetic materials are led, which certainly contributed to the success in the synthesis and processing of high-infusible insoluble polymer, which is represented by PTFE-4. These heat-resistant and wear-resistant polymer materials are needed to meet the needs of many branches of modern technology. Therefore, the creation of polymeric materials with improved tribological properties complex (such as high-strength) is the main direction of modern chemistry, physics, and polymer technology [1–3].

Valuable performance characteristics of PTFE stimulate further researches aimed to examine the feasibility of creation new composites based on it for work in extreme conditions.

The purpose, objects and methods of research. Considering the above mentioned the objective of this work is creation of organic plastics of tribotechnical purpose and investigation of the effect of fiber content on the tribological properties and studying of the nature of interaction of the fiber-binder [4].

CM on the basis of the of PTFE reinforced with organic fiber Tanlon were selected as the object of study. Fiber Tanlon was obtained on the basis polysulfonamide (PSA) (made in China).

Polytetrafluoroethylene-4 (PTFE) – chemical formula – $[-CF_2-CF_2-]_n$.

Polyacetal 4 – polymeric material, a polymerization product of tetrafluoroethylene:
 $nCF_2 = CF_2 \rightarrow [-CF_2 - CF_2-]_n$.

As a method of investigating the interactions that occur between the PTFE binder and fiber Tanlon in CM was selected IR spectroscopy. IR spectra of CM are shown in Fig. 3–5.

Infrared Nicolet 380 spectrometer (manufactured by Thermo Electron Corporation, USA) was used to perform infrared spectroscopic analysis. Description of the instrument IR-spectrometer Nicolet IR 380. Fourier spectrometer is a stationary automated desktop device consisting of a two-beam interferometer, the radiation source and receiver, the optical system and the electronics.

Due to its chemical structure (twisting of the carbon chain and the large Van-der-Waals radius of fluorine atoms and high bond strength of carbon and fluorine atoms) PTFE-4 has excellent chemical resistance and a number of other positive qualities, differentiating the material. It is resistant to almost all acids, bases, organic and inorganic solvents, petroleum products, a wide range of temperatures: from 4 to 533 K, except for molten alkali metals, chlorine trifluoride and elemental fluorine. The chemical resistance of the PTFE allows to use this material in the chemical industry for the manufacture of various parts of chemical apparatus, tanks, pipes, membranes, gaskets, seals, pumps. The biological inertness of the material ensures the wide use of this material in the medical, pharmaceutical and food industries. In particular, in medicine, it is widely used vascular prostheses, implants and sutures made from PTFE.

High temperature resistance combined with excellent dielectric characteristics of the material allows its use in electrical and radio engineering as insulation of wires, cables, connectors for printed circuit boards, insulation and details for electrical machines and microwave technology.

PTFE has a very low coefficient of friction, virtually not wetted by water and organic liquids, which, combined with a wide operating temperature range, good mechanical and adhesive properties, the equation of static and dynamic friction torque makes this material indispensable in mechanical engineering as anti-friction and cushioning one [5, 6].

IR-spectrum of source PTFE binder is shown in Fig. 1: a PTFE sample of Russian production.

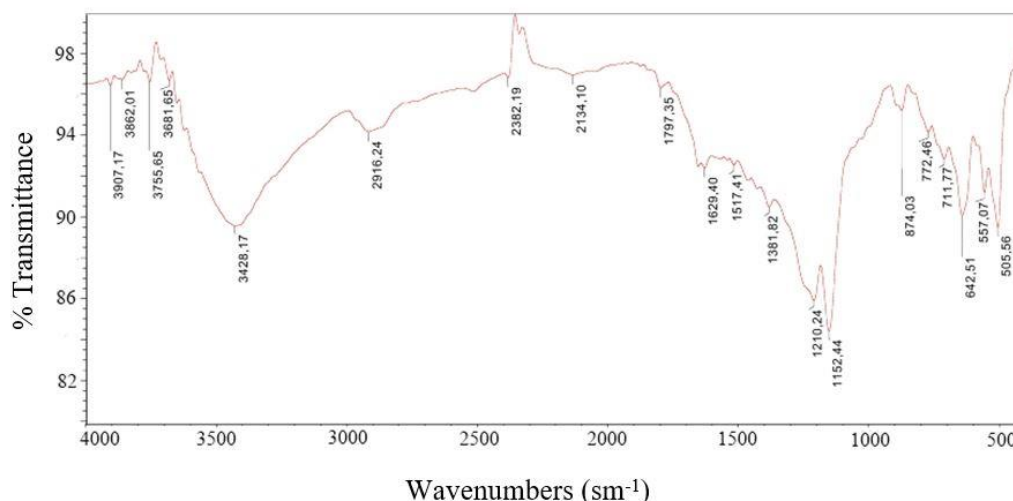
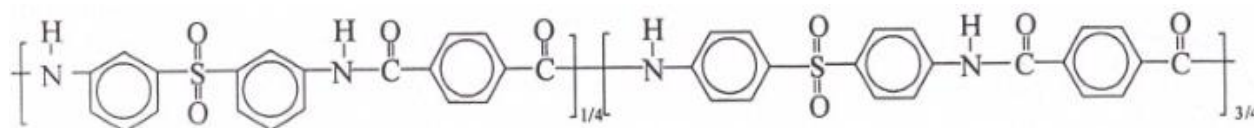


Figure 1. IR spectrum of PTFE

Fiber Tanlon is made of copolymer of polysulfonamide of the following structure:



IR spectrum of the pure fiber talon is shown in Fig. 2.

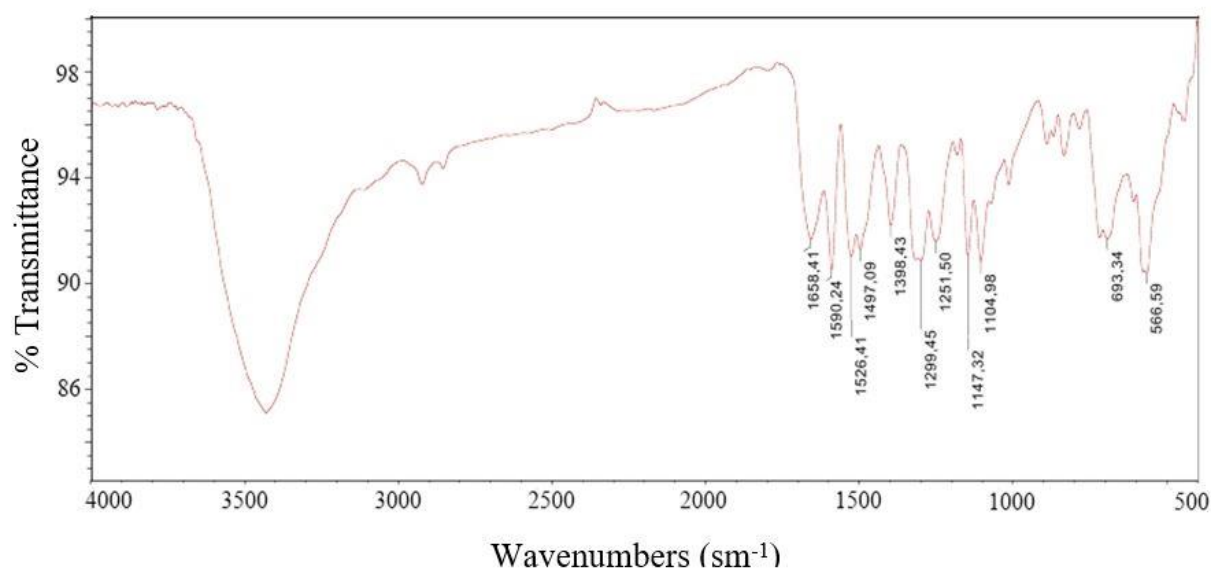


Figure 2. IR spectrum of the pure fiber Tanlon

High activation energy of thermal decomposition, their consistency over a wide temperature range are typical for PSA. Poly-3,3' difenilensulfonizoftalamid is more resistant to thermal stresses than poly-4,4 difenilensulfontereftalamid that is at odds with established concepts [7]. Therefore, in our case, we used samples based on fibers metaparabloksopolimera PSA (Table 1).

Table 1

Composition of the press compositions

Filler	Sample number	Composition, wt. %	Binder	Composition, wt. %
fiber Tanlon	1	0	PTFE	100
	2	5		95
	3	10		90
	4	15		85
	5	20		80
	6	100		0

Method for processing of PSA is determined primarily by specific properties inherent to this class of polymers: high rigidity of macromolecules and strong intermolecular interactions and, consequently, low formability in softening point and yield, making them difficult to recycle by conventional means, and under normal conditions [8]. Considering that the melting point of the aromatic polyamides is in the range 673 K, i.e. temperatures at which frequent decomposition begins, the processing of the investigated CM was produced at temperatures which lie above the softening temperature and below its melting point by compression molding in a hydraulic press CSP-50 at a pressure of 70 MPa.

Recording IR spectrum: the range of 4000–500 cm^{-1} ; (Fig. 1–6, Tab. 2).

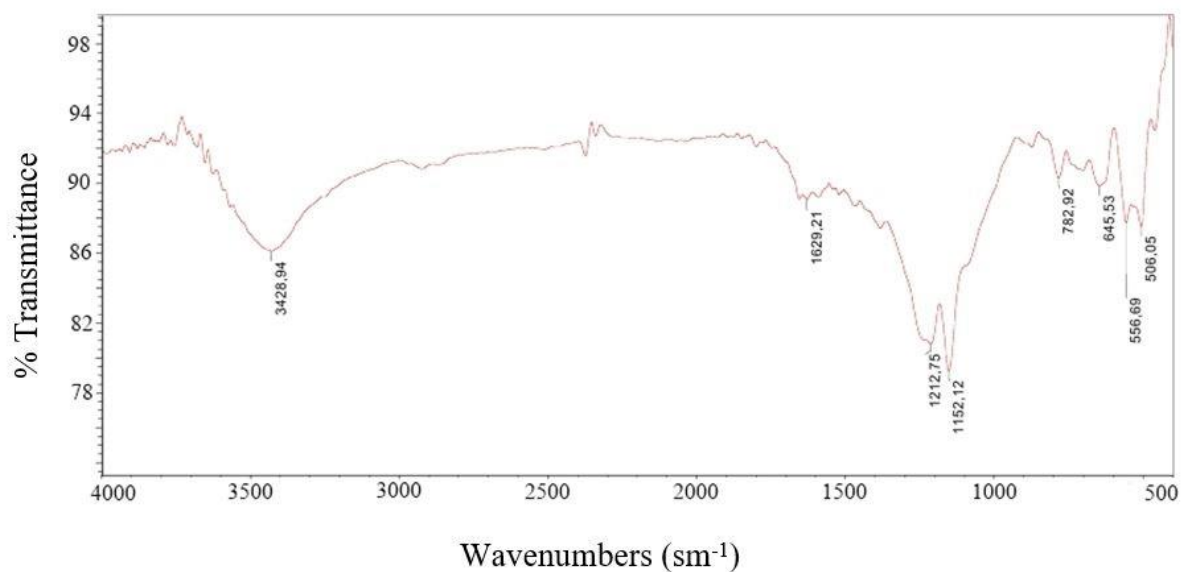


Figure 3. IR spectrum organoplastic based on PTFE containing 5 wt.% fiber Tanlon

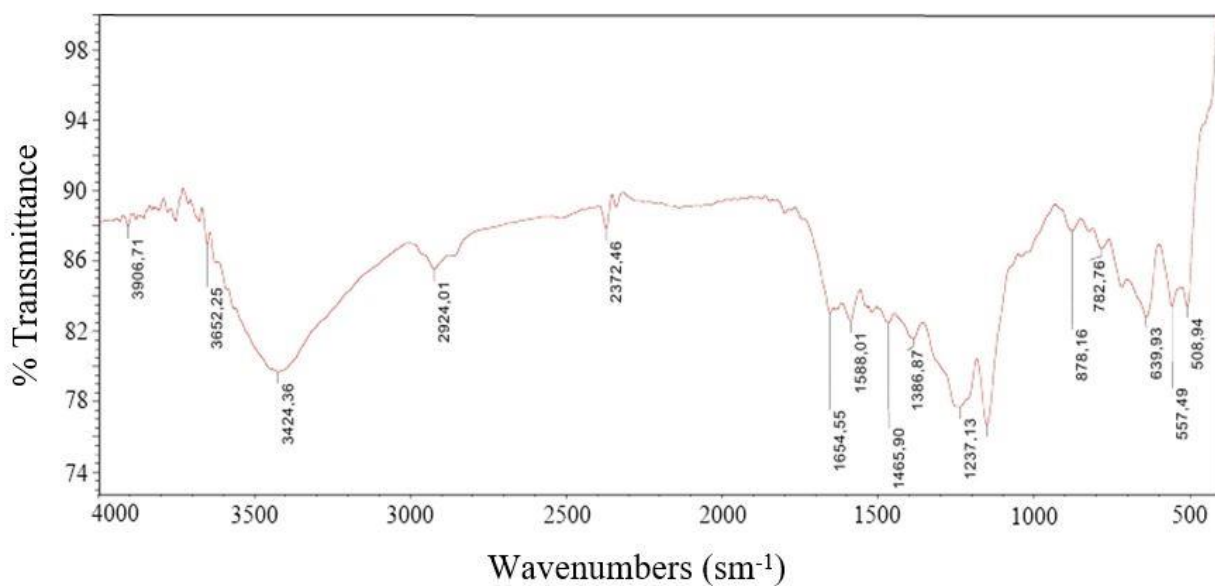


Figure 4. IR spectrum organoplastic based on PTFE, containing 10 wt.% fiber Tanlon

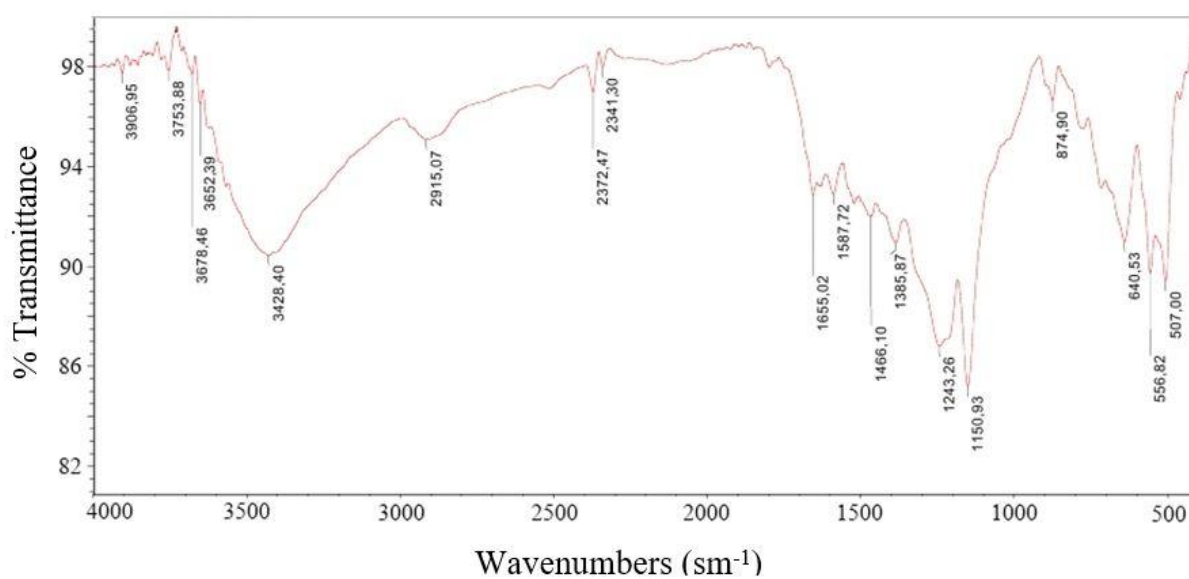


Figure 5. IR spectrum organoplastic based on PTFE, containing 15 wt.% fiber Tanlon

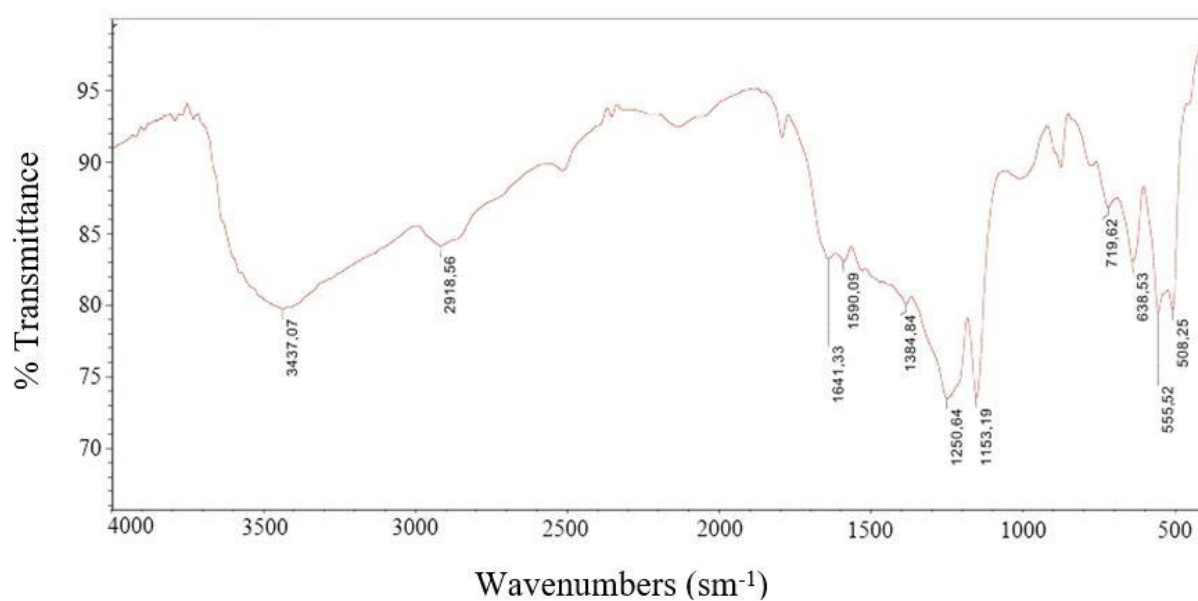


Figure 6. IR spectrum organoplastic based on PTFE, containing 20 wt.% fiber Tanlon

Table 2

Assignment of bands in the IR spectra of the CM-based binder and fibers PTFE Tanlon*

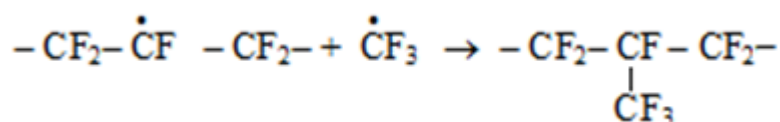
The fiber content, weigh wt. %	Wavenumber cm^{-1} , ν – stretching vibrations, δ – deformation vibrations of the band in the IR spectra**						
	-SO ₂ $\nu_{\text{as}}=1320-1300$ $\nu_{\text{s}}=1460-1140$ or $\nu_{\text{as}}=1360-1335$ $\nu_{\text{s}}=1170-1160$ [9]	CF ₂ $\nu_{\text{as}}=1350-1200$ (v. st.) $\nu_{\text{s}}=1200-1100$ (v. st.) [10]	C-F in the far region 2 in the range of 680-480 bars (ar.) and one in the range of 300-200 (ar.) [9]	Amide bands		$\nu_{\text{N-H}}$ in the near field and the substitution in benzene ring [9]	N-communication and interfacing
				Amide I (s.)	Amide II (s.)		
0 (Fig. 1)	–	as: 1210,2 (s, br.); s: 1152,4 (v, st., nr.)	642,5 (ar., nr.); 567,3 (we., nr.); 505,6 (ar., nr.)	$\nu_{\text{C-O}}=1650$ (associated form) 1690 (free form) [10]	$\delta_{\text{N-H}}=1640$ (associated form) 1600 (free form) [10]	$\nu_{\text{C-N}}=1420-1405$ $\nu_{\text{C-N}}=1300-1250$ [10]	Intermolecular N-communication 3400-3200 (s, br.) π -cl. cloud – 3600-3500 (vr. br.)
5 (Fig. 3)	as: 1382,6 (ar., br.); s: blocked off ν_{as} (CF ₂)	1212,8 (s, br.); 1152,1 (v, s., nr.)	645,5 (ar., br.); no spectrum below 600 cm^{-1}	double 1653,8 (we.) 1629,4 (we., nr.)	1587,6 (ar., nr.) free form	2923,4 (we., br.) 3428,9 (s, br.)	Br. band $\nu_{\text{max}} = 3428,2$ (s.). The group of narrow bands in the weak. 3651-3907 (we.); 2516,2 (we., br.); 2916,2 (ar., br.) $\nu_{\text{max}} = 3428,9$ (s, br.); 2923,1 (we., br.); 2373,9 (we., nr.). The group of narrow bands in the weak 3628,7-3906,6
10 (Fig. 4)	as: 1386,9 (ar., br.); s: blocked off ν_{as} (CF ₂)	1237,1 (s, br.); 1151,6 (s, br.)	639,9 (ar., nr.); no spectrum below 600 cm^{-1}	1654,8 (ar., br.) – assoc. the form	1588 (ar., nr.) free form	2924 (ar., br.) 3424,4 (v, st., br.)	$\nu_{\text{max}} = 3424,4$ (v, s., br.); 2924,0 (ar., br.); 2372,5 (ar., nr.) The group of narrow bands in the weak 3652-3906,7
15 (Fig. 5)	as: 1385,9 (ar., br.); s: blocked off ν_{as} (CF ₂)	1243,3 (s, br.); 1150,9 (v, s., nr.)	640,5 (ar., nr.); no spectrum below 600 cm^{-1}	1655,0 (ar., with shoulder) – assoc. the form	1587,7 (ar., nr.) free form	2915,1 (ar., br.) 3428,4 (s, br.)	$\nu_{\text{max}} = 3428,4$ (s, br.); 2915,1 (ar., br.); not identified
20 (Fig. 6)	as: 1384,8 (we., nr.); s: blocked off ν_{as} (CF ₂)	1250,6 (v, s., br.); 1153,2 (v, s., nr.)	638,5 (ar., nr.); no spectrum below 600 cm^{-1}	1641,3 (ar., br.) – assoc. the form	1590,1 (ar., nr.) free form	2918,6 (ar., br.) 3437,1 (s, br.)	$\nu_{\text{max}} = 3437,1$ (s, br.); 2918,6 (ar., br.); 2515,4 (we., nr.); 2135,9 (we., br.);
100 (Fig. 2)	as: 1299,45 (ar., br.); 1398,43 (ar., nr.) s: 1182,28 (ar., nr.); 1147,32 (ar., nr.)	–	–	1658,41 (ar., br.) – assoc. the form	1590,24 (ar., nr.) free form	3430,73 (v, s., br.) $\nu_{\text{C-N}}=1251,5$ (ar., br.); $\nu_{\text{C-N}}=1497,09$	$\nu_{\text{max}} = 3430,73$ (v, s., br.); 2922,95 (we., nr.); 2854,78 (we., nr.); 2285,70 (we., br.)

Note: * copolyamide Tanlon: initial composition: $\omega_{(3,3-\text{DADES})} = 25\%$; $\omega_{(4,4-\text{DADES})} = 75\%$; $\omega_{(\text{HATKK})} = 100\%$, where DADES – diaminodiphenylsulfone; Shed – terephthalic acid dichloride.

Discussion of results. Analysis of IR spectrum of the binder in the CM – PTFE-4 (Fig. 1). From the reference literature [11] it is known that PTFE is used in IR spectroscopy for the preparation of tablets and pastes to remove the IR-spectra of other substances in the middle region of the IR spectra ($5000\text{--}1333\text{ cm}^{-1}$). It is also known that the Raman spectra (RS) and IR absorption complement each other. But the stimulation of Raman transition is determined by the change of polarizability under the laser source stimulation, whereas IR absorption is determined by the change in the dipole moment of connection. Weak lines in the spectrum of IR absorption (for example, caused by stretching valent vibrations of group $\text{R}_2\text{C}=\text{CR}_2$, $-\text{S}\equiv\text{N}$ etc.) become strong lines in the Raman spectrum, and vice versa. Overview of questions comparing the IR spectra with the Roman spectra are in this work [11–14]. If we consider Fig. 1 as an IR spectrum of PTFE- 4, our sample clearly can not be used as an optically transparent material in the region of $5000\text{--}1333\text{ cm}^{-1}$, because it has absorption bands at $1331,8$ (we.); $1517,4$ (v., we.); $1620,4$ (v., we.); $1653,8$ (v., we.); $1797,3$ (v., we.); $1216,1$ (v., we.); $2916,2$ (we., br.); $3428,2$ (s., br.); $3651,8$ (v. we., br.); $3677,7$ (v. we., nr.); $3755,6$ (we., nr.); $3862,0$ (v. we., br.); $3907,2$ (v. we., nr.). It is necessary to establish the cause of these absorption bands. It is known from the literature [5] that the most intense bands are stretching vibrations of CF_2 (1211 and 1154 cm^{-1}) and vibration $\nu_{(\text{C-C})}$, which manifests itself in the form of inflection in the 1233 cm^{-1} . In the region below 650 cm^{-1} are arranged deformation ($\delta_{(\text{CF}_2)}$) and out-of-plane vibrations CF_2 ; fan vibrations $\gamma_{\omega(\text{CF}_2)}$ appear at 639 cm^{-1} ; strips 555 and 516 cm^{-1} is characterized by expansion and pendular oscillations CF_2 -groups, respectively.

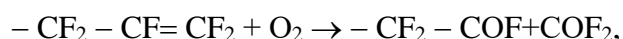
The modifying of PTFE happens under the action of radiation, electronic, laser, thermal and mechanical processing [5]. As a result, formation of radicals that promotes crossing macromolecules, branching or forming of products from shorter chains and the emergence of defects in the structure associated with the appearance of the side chains

– $\text{CF}-\text{CF}_3$ – groups according to Scheme 1:



Is reflected band at 986 cm^{-1} and 1786 cm^{-1} ($\gamma-\text{CF}=\text{CF}_2$) – terminal groups. Both bands are visible in the IR spectra of fluoroplastic-4 after treatment at temperatures $323\text{--}373\text{ K}$, decreasing with increasing temperature $473\text{--}523\text{ K}$ and when processed at 573 K , they almost disappear. If the band 1885 cm^{-1} appears in the IR spectrum of fluoroplastic, it applies to the appearance of the the structures of terminal carbonyl groups. And the appearance of the band at 1778 cm^{-1} – to end the olefin $-\text{CF}=\text{CF}_2$; and at $\approx 1750\text{ cm}^{-1}$ – $>\text{C}=\text{CF}_2$ in the lateral branches.

When irradiated with high doses of radiation bands at 1730 , 1717 and 1671 appear, which also refers to fluctuations $-\text{CF}=\text{CF}_2$ and $-\text{CF}=\text{C}<$. The interaction of generated radicals with oxygen takes place at irradiation with high doses of radiation; especially in the presence of water vapor. Thus there are the bands at 1810 and 1780 cm^{-1} , which refers to fluctuations of groups $-\text{COOH}$. After annealing at $553\text{--}593\text{ K}$ of irradiated sample of PTFE strip $-\text{CF}=\text{CF}_2$ disappears along with bands 1730 , 1717 and 1671 cm^{-1} that connected to the scheme 2:



Amide groups $-\text{CONH}_2$ и NH_4^+ can appear in electronic or UV irradiation in a nitrogen atmosphere in a chain of PTFE: $-\text{CONH}_2$ and NH_4^+ [10]. The crystallinity and amorphous of PTFE may be determined by the band at 780 cm^{-1} (amorphous phase) and 640 , 625 , 516 – crystalline phase. It is interesting to note that these bands are vanishing during melting of PTFE,

and in return a broad band at 640 cm^{-1} appears. Helical conformation of macromolecules of PTFE and characterized by a doublet $640\text{--}625\text{ cm}^{-1}$ [11–14].

The band at 625 cm^{-1} characterizes the structural defects, i.e. portions of the chain where there are transitions between left- and dextrorotary spirals and the band at 640 cm^{-1} reflects the presence of a regular helix in the structure of PTFE. Asymmetric band has its maximum 648 cm^{-1} . The temperature of $323\text{--}383\text{ K}$ corresponds to fractions with one twisting helix of molecular chain. At temperatures $383\text{--}563\text{ K}$ at the structures of fractions appear chain sections where transitions between right and left rotating spirals occur. Fractions marked at temperatures above 573 K have a conformational similarity with the original polymer. At high pressures, the transition occurs from the spiral structure of the PTFE to the planar: the intensity of spectral bands at 1210 and 640 cm^{-1} are significantly reduced. Thus, the order in the structure of PTFE decreases with increasing temperature and pressure.

In our IR spectrum sample of PTFE binder main bands can be identified as in Table 3

Table 3

Main bands PTFE

Band cm^{-1}	Fluctuations	Classification
505,6 (ar.)	pendular	CF_2
567,3 (ar.)	deformational	$\delta(\text{CF}_2)$
642,5 (ar.)	crystalline phase	
772,5 (we.)	amorphous phase	
874,3 (we.)	branching	$\begin{array}{c} \text{--CF--} \\ \\ \text{CF}_3 \end{array}$
1152,4 (v. s., nr.)	symmetrical wave	$\text{vs}(\text{CF}_2)$
1210,2 (s., br.)	asymmetrical wave	$\text{vas}(\text{CF}_2)$
1653,8 (we.) a doublet 1629,4 (we.)	side branching	$\text{v}(\text{--CF}=\text{C}<)$
1797,3 (we.)	wave endgroups	$\text{v}(\text{--CF}=\text{CF}_2)$
2916,2 (ar.)	wave trans-olefin	$\begin{array}{c} \text{F} \\ \\ \text{--C}=\text{C--} \\ \\ \text{F} \end{array}$
3428,2 (s., br.)	π – electron cloud in the olefins (conjugation)	

Consequently, there is enough excess energy for interactions with excipients in the macromolecules of PTFE binder. Comparison of the IR spectra of PTFE and CM (PTFE + fiber Tanlon (Fig. 1 and 3–6) shows that the largest changes are observed in the areas associated with the order of molecules of PTFE, end groups $\text{--CF}=\text{CF}_2$, π -electron pairing as well as an increase of the intensity of the vibrations vas and $\text{vs}(\text{CF}_2)$ -groups. The highest order (one form of spiral, crystallinity) is characteristic of the sample of CM with 15 wt.% of Tanlon fiber, and with the greatest persistence of end groups $\text{--CF}=\text{CF}_2$ and π -electron pairing. The strongest chemical interactions are detected as for the CM sample with 20 wt.% of fiber Tanlon: except the isomerization of chains' parts of PTFE detected the presence of cumulated double bonds immonium strips, 3 membered cyclopropane, epoxy, aziridine, $\text{--CH}_2\text{--F}$ – oblast $300\text{--}2000\text{ cm}^{-1}$: $\text{v}(\text{ketenes}; >\text{C}=\text{C}=\text{O}) = 2150\text{ (s.)}$ and 1120 (s.) ; $\text{v}(\text{carbodiimides}; \text{--N}=\text{C}=\text{N--}) = 2140\text{--}2130\text{ (v.s.)}$; $\text{vas}(\text{isocyanates}; \text{--N}=\text{C}=\text{O}) = 2275\text{--}2260\text{ (s.)}$ and $\text{vs}(\text{--N}=\text{C}=\text{O}) = 1390\text{--}1350\text{ (ar.)}$; $\text{v}(\text{isothiocyanates}; \text{--N}=\text{C}=\text{S}) = 2140\text{--}1990\text{ (ar.)}$; $\text{v}(\text{--N}=\text{S}=\text{O}) = 1300\text{--}1200, 1800\text{--}1100$; $\text{v}(\text{alkyne}; \text{R--C}\equiv\text{C--H}) = 2140\text{--}2100\text{ (ar.)}$; skeletal vibrations:

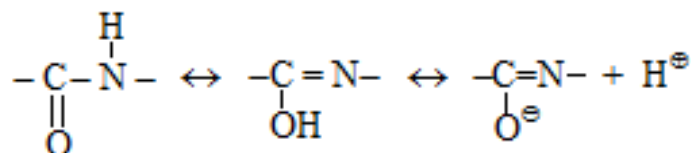
$\nu(\nabla, \nabla, \nabla, -\text{CH}_2-\text{F})=1010$ (ar.); $\delta(\nabla, \nabla, \nabla, -\text{CH}_2-\text{F})=3050$ (ar.). immonium compounds $\text{R}_2\text{C}=\text{N}^{\oplus}\text{H}$ have $\nu(\text{N-H})=2500\text{--}2300$ (ar.), $2200\text{--}1800$ (ar.) and $\nu(\text{C=N})=1680$ cm^{-1} [11].

All these groups may occur during the flow of a series of chemical reactions between the fiber Tanlon and PTFE at elevated temperature, electromagnetic influence and laser excitation.

Consequently, the highest order of bonds isobserved in the CM, containing 15 wt.% of the fiber Tanlon and most chemical reaction between PTFE and fiber Tanlon (but the largest following «aggressiveness», reactivity) was found for the CM sample containing 20 wt.% of Tanlon.

Analysis of the IR spectrum of the fiber Tanlon.

Fig. 2 is an IR spectrum of the fibers Tanlon, on the basis of which, as well as the data in Table 2 it can be concluded that the fiber has Tanlon reaction sites capable of interacting with PTFE in the form of primary end-groups ($\nu(\text{N-H})=343$ cm^{-1}), enol and enamine groups ($\nu=1104,38$ (ar.), $1013,52$ (we.), which may be formed according to Scheme 3:



Besides, $\text{O}^{\delta-}=\text{S}^{\oplus}=\text{O}^{\delta-}$ -groups may constitute centers (as sulfur atoms, particularly in the meta-substituted portions of Tanlon macromolecules) for electrophilic attack of fluorine atom with electrical excess and its dissociated ion-imine forms. Also, the presence of $(-\text{C}=\text{N}-)$ linkages, especially, in the para-substitution, and may act as π -electrons to pair, and as the reaction center. It is likely that Tanlon bears charged groups HSO_4^{\oplus} .

From the comparison of the IR spectra of the fiber Tanlon (Fig. 2) and IR spectra of CM with different concentrations of wt.% Tanlon fiber (Fig. 3–6), it follows that the interaction of the Tanlon and PTFE is available in all CM. The strongest chemical interaction of the fiber is typical for the CM samples with 10–20 wt.% of the fiber, and this cooperation is carried out by:

NH-groups both in the meta and para positions; NH_2 -end groups; death of $-\text{C}=\text{N}-$ groups; reacting of sulfone $-\text{SO}_2-$ groups; H-bonds in the fiber. Cleavage of hydrogen atoms, enimin and enol OH-groups; the formation of new products, new hydrogen bonds (interpolimer), new π -electron systems of interface (interpolimer).

Conclusions. Interactions between the components of CM both of physical and chemical nature are exist. The greatest physical interaction of PTFE (and the largest its order, stability) is observed for the CM sample with $\omega(\text{tranlon})=15$ wt.%. The largest chemical reaction from both PTFE, and fiber Tanlon is observed in the CM sample $\omega(\text{tanlon})=20$ wt.%. Moreover, this CM is not chemically stable because it contains new multiple bonds (cumulated double, triple), and there are new H-bonds of interpolimer character in it. Chemical reacting of both components $-\text{CF}=\text{CF}_2$ and NH_2 end groups as well as $-\text{C}=\text{N}$, $-\text{SO}_2-$, $>\text{C}=\text{O}$, $-\text{C}(\text{OH})=\text{N}-$; $>\text{C}=\text{CF}_2$ and isomerization of PTFE chains with free radicals forming are mostly can be. The physical interaction is a breaking of hydrogen bonds in the fiber Tanlon, ordering a helical configuration of PTFE, the increase in the crystallinity of PTFE are most likely.

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ІЧ-СПЕКТРАЛЬНИЙ АНАЛІЗ ОРГАНОПЛАСТИКІВ НА ОСНОВІ ПОЛІТЕТРАФТОРЕТИЛЕНУ

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Резюме. На сьогодні композиційні матеріали на полімерній основі, армовані органічними волокнами, за обсягами виробництва перевершують сталь, алюміній, чавун і пластмаси завдяки своїм унікальним властивостям: високій хімічній стійкості, низькій густині (вони легші за вуглепластики і склопластики), здатності до тривалого накопичення пошкоджень в об'ємі деталі без утворення критичних тріщин. Великого застосування знаходять органопластики на основі термостійких термопластичних в'язучих, одними з перспективних представників яких є фторполімери, в тому числі політетрафторетилен (фторопласт-4), який добре відомий своєю винятковою стійкістю до дії агресивних середовищ (лугів, кислот, нафтопродуктів, органічних та неорганічних розчинників), широким температурним діапазоном експлуатації (4–533 K), низьким коефіцієнтом тертя та природною змащувальною здатністю. Враховуючи вищесказане, розроблення нових органопластиків, здатних працювати у важких умовах (при підвищених навантаженнях і температурах, дії агресивних середовищ), у тому числі на основі фторполімерів з поліпшеними експлуатаційними характеристиками, що є актуальним завданням для сучасного матеріалознавства. Наведено ІЧ-спектри органопластиків на основі політетрафторетилену, армованого полісульфонамідним волокном марки Танлон Т700. Встановлено, що при введенні 5–20 мас. % існує взаємодія хімічної та фізичної природи між компонентами розроблених органопластиків. З отриманих даних слід зазначити, що найбільша хімічна взаємодія як з боку політетрафторетилену, так і з боку волокна Танлон спостерігається для композиційного матеріалу, що містить 20 мас. % наповнювача. При цьому даний органопластик хімічно нестабільний, тому що містить нові кратні зв'язки (кумуляовані, подвійні, потрійні), а також у ньому виникають нові Н-зв'язки міжполімерного характеру.

Ключові слова: органопластик, політетрафторетилен, волокно, Танлон, ІЧ-спектральний аналіз.

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