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IDENTIFICATION AND CONTROL OF THE POLYOLEFIN CODE ON THE COMMERCIAL NOMENCLATURE OF FOREIGN ECONOMIC ACTIVITY

Abstract: *It is established that the studied samples of polypropylene goods contain different types of organic and macromolecular structures. The ratio of substances in the composition of polyethylene materials was identified using IR spectroscopy, density, MFR. As a result, we recommended new CN FEA code numbers for polypropylene to protect Uzbekistan's economic interests in international relations.*

Key words: *Commercial nomenclature of foreign economic activity, export-import, polyolefin, stereoisomers of polypropylene, identification, IR spectroscopy, melting point, density.*

Language: *English*

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Introduction

Polyolefin penetrated all the dominant sectors of the economy: electronics, electrical engineering, mechanical engineering, automotive, instrument making, transportation, construction. Today, the chemical industry of Uzbekistan, with significant production, raw materials and scientific and technical potential, is one of the leading basic sectors of the country's economy. According to experts, the estimated annual growth rate of the global chemical industry will be 2.7%, and by 2030 the global market for chemical products will reach 4391 thousand billion US dollars. [1]

In Uzbekistan, polypropylene consumption is growing year after year. Polypropylene export in 2018 amounted to 23,443.4 tons (25,459.5 thousand US dollars). And also, the import of polypropylene in 2018

amounted to 36,977.0 tons (49,752.2 thousand US dollars) (table-1). [2]

The identification and classification of polypropylene in primary forms and products made of them is in most cases accompanied by the involvement of experts or qualified specialists in the relevant field of knowledge, since the code control of such goods according to the HS of the Republic of Uzbekistan is difficult due to the specificity of the classification criteria and the lack of a comprehensive information base.

Table 1.

Export	**3902100000 – Polymers of propylene or other olefins in primary forms: polypropylene**					
	2016 y.		**2017 y.**		**2018 y.**	
	number, in tons.	thousand dollars USA	number, tons.	thousand dollars USA	number, tons.	thousand dollars USA
	60 628,7	47 291,3	49 992,3	44 743,5	23 443,4	25 459,5
Import	**3902100000 – Polymers of propylene or other olefins in primary forms: polypropylene**					
	65 591,8	93 293,3	47 653,6	52 531,8	36 977,0	49 752,2

The application of the procedural mechanism of interaction with expert organizations lengthens the timeframes for decision-making; many issues arising in the process of customs control of polypropylene in primary forms and products from them can basically be resolved on the spot. In practice, in most cases, an examination is appointed to identify any material from which the goods are made, and the expert opinions obtained are used to secure. [3]

2 MATERIAL AND METHODS

VII section of the HS of the Republic of Uzbekistan “Plastics and products from them; rubber, rubber and articles thereof” is intended for the classification of goods from plastic and rubber, both raw materials and products of their processing. The basic principle of the construction of the section is the chemical composition of the goods. This section includes two groups 39 and 40. The general criterion for assigning goods to the group of the section is the structure - these are polymers, the difference is according to the criterion for the presence of elastic properties. [4]

The main features of the classification of plastics in primary forms are: type of polymer, specific gravity, structure, physical properties, composition, shape and size of granules, state of aggregation, hydroxyl number, and purpose. [5]

3902	Polymers of propylene or other olefins in primary forms:	
	3902 10	- polypropylene
	3902 20	- polyisobutylene
	3902 30	- propylene copolymers
	3902 90	- other

Today there are several varieties of polypropylene, all of them have the same formula, but differ in spatial molecular structure: isotactic, syndiotactic, atactic.

The stereoisomers of polypropylene (isotactic, syndiotactic, atactic and stereoblock) significantly differ in mechanical, physical and chemical properties.

Atactic polypropylene is a rubbery product with high fluidity, melting point ~ 80 ° C, density 0.85 g / cm3, it is well soluble in diethyl ether and in cold k-heptane.

Isotactic polypropylene in its properties compares favorably with atactic; in particular, it has a higher modulus of elasticity, a higher density (0.90-0.91 g / cm3), a high melting point (165-170 ° C) [6], better resistance to chemicals, etc. n. In contrast to the atactic polymer, it is soluble only in certain organic solvents (tetra line, decal in, xylene, toluene), and only at temperatures above 100 °C. The X-ray stereo block polymer of polypropylene exhibits certain crystallinity, which cannot be as complete as that of purely isotactic fractions, since atactic sites cause disturbances in the crystal lattice. [7]

3.8 billion cubic meters of marketable gas, 387 thousand tons of polyethylene, 83 thousand tons of polypropylene are produced at the Us yurt gas chemical complex at the Surge field. According to international news agencies, the demand for polypropylene - the second most abundant polymer in the world - is increasing by 4-6% annually. In 2017, world consumption of polypropylene exceeded 69 million tons.

At the moment, Uz-Cor Gas chemical complex has produced the following grades of polypropylene (table-2): [8]

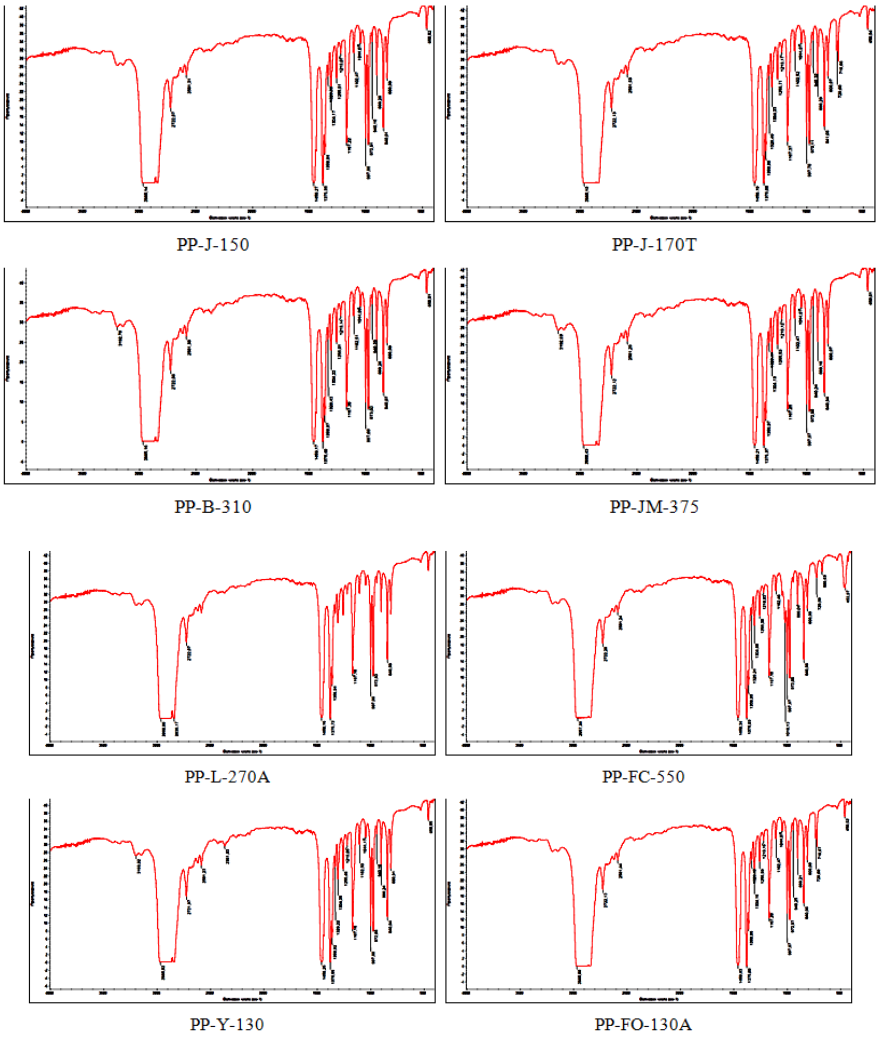
Table 2.

Brand	Density, g/cm^3	Flow rate, g/10min	Melting point, ^{0}C	Application
Injection				
J-150 PP H	0.85~0.95	8-12	160	Household goods
J-170T PP H	0.85~0.95	23-33	160	General household goods, stationery, disposable syringes
J-330 PP B	0.85~0.95	3-5	160	Household goods (spoons, cups), stationery, toys
J-350 PP B	0.85~0.95	8-12	160	Battery cases, housings for household appliances
J-360 PP B	0.85~0.95	14-22	160	Battery cases, housings for household appliances
J-370 PP B	0.85~0.95	30-40	160	Large Injection Products, Household Electrical Appliances
JM-375 PP-B	0.85~0.95	40-50	160	Large Injection Products, Household Electrical Appliances
J-550S PP R	0.85~0.95	10-14	160	Cosmetic containers, cups, food containers, transparent cases, stationery, disposable syringes, CD/DVD cases, etc.
Blown				
B-310 PP-B	0.85~0.95	0.4-0.6		Chemical bottles, food trays, etc.
B-520 PP-R	0.85~0.95	1.8-2.2	140	Gum Bottles, Detergent bottles, Cosmetic Bottles
B-320 PP-B	0.85~0.95	0.8-1.2	160	Industrial sheets, food packaging trays, etc.
Yarn Fibers				
Y-120 PP H	0.85~0.95	0.8-1.2	160~165	Monofilament yarn
Y-130 PP H	0.85~0.95	3-5	160~165	Monofilament yarn
FR-160 PP H	0.85~0.95	15-19	155~165	Multi-thread tapes
FR-170H PP H	0.85~0.95	24-27	155~165	Multiti, BCF, staple fiber
Film				
FO-130A PP H	0.85~0.95	2.8-3.2	155~165	Oriented for General Purpose Films
FC-550 PP R	0.85~0.95	7-9	155~165	Thermo-adhesive layer for non-oriented films
FI-151 PP H	0.85~0.95	7-9	155~165	General Purpose IOPP Films, Shrink Films
L-270A PP H	0.85~0.95	24-28	155~165	Kraft paper coating

Using the Fourier method, IR spectrometry was used to identify the functional groups of stereoisomers of polypropylene (Fig. 1). IR spectra were recorded and processed on a Perkin Elmer Spectrum Version 10.4.3 IR Fourier spectrometer with a resolution of 4 cm^{-1} in the frequency range from 4000 to 400 cm^{-1}.

3 RESULTS ACHIEVED

Fig. 1. IR spectra of stereoisomers of polypropylene



4 DISCUSSION

The analysis of the IR spectrum of PP grades showed that in the region of the highest frequencies (2950–2970 cm^{-1}) there are bands corresponding to stretching vibrations of aliphatic CH3 groups (table-3). Among the various combinations of bands used as isotactic indices, the ratio of peak areas of 998 cm^{-1} to 973 cm^{-1} is one of the most common.

Table 3. Characteristic frequencies for some functional groups [9]

Frequency Range (cm^{-1})	Attribution
2950-2970	Valence asymmetric vibrations of aliphatic CH_3 groups
2600-3100	O-H stretching vibrations in H-bonded RC(O)O-H
1450-1470	Deformation vibrations of aliphatic CH_2, CH_3 groups
~1240	C-O stretching vibrations in $CH_3C(O)=OR$
1000-1250	C=S stretching vibrations
985-995	CH deformation vibrations in $RHC=CH_2$
800-900	Mostly C-C deformation vibrations

To interpret the vibrational spectra of polymers, it is necessary to know the spectral repeating chain link, i.e. such a unit from which the whole macromolecule can be built by certain operations of symmetry. Sometimes this unit coincides with the monomer unit of the chain (isotactic polypropylene), in some cases it contains two monomer units (syndiotactic polypropylene, polyacrylonitrile) or includes only

"half" of the small unit (polyethylene). When analyzing the spectrum, it should be borne in mind that the number of characteristic vibrations for a given chemical group will be different depending on whether this group belongs to a polymer or non-polymer molecule. For example, consider the characteristic vibrations of the —CH_2— group. In the non-polymer CH_2Cl_2 molecule, the CH_2 group is characterized by three characteristic vibrations: two stretching vibrations in the range of 2940–2915 cm^{-1} and 2885–2860 cm^{-1} and one deformation vibration in the range of 1480–1460 cm^{-1}. In a polymer molecule containing —CH_2— groups, one should expect six characteristic vibrations: twice the number of the three characteristic vibrations mentioned above, polarized, however, in different ways — parallel and perpendicular to the axis of the chain.

The results of experimental work allow us to classify polypropylene in primary forms by molecular structure.

5 CONCLUSIONS

In conclusion, it should be noted that the study of the classification of polypropylene polymers according to their physicochemical composition can clarify some controversial issues of the HS of the Republic of Uzbekistan. And also it can be noted that, the studied brands of polypropylene are classified by heading 3902 TN FEA RUz. [4]

The development of new product codes makes it possible to protect the economic interests and security of the economy of Uzbekistan in international relations.

As a result of studies using customs examination for stereoisomers of polypropylene in primary forms, the following new code numbers for CN FEA are recommended. (table 4).

Table 4. Recommended code numbers for stereoisomers of polypropylene in primary forms according to the Commodity Nomenclature of Foreign Economic Activity (in a new subheading)

Recommended CN codes	Type of polypropylene	T_m, ^0C	Density, g/cm^3	The density of crystals, g/cm^3	The range of molecular weight distribution, $x10^3$
3902 10 000 1	Isotactic PP	165	0,90-0,91	~0,94	50-630 (1-chloronaphthalene, 145 ^0C) 20-620 (decalin, 135 ^0C)
3902 10 000 2	Syndiotactic PP	155	0,86-0,89	0,93	90-450 (heptane, 30 ^0C)
3902 10 000 3	Atactic PP	~80	0,85	-	20-40 (heptane, 30 ^0C)

The listed varieties of polypropylene in chemical composition include polypropylene consisting of carbon and hydrogen. However, they differ significantly in molecular weight, structure, density, melting point, price and other properties associated with the conditions of their production, their application areas.

Thus, for the identification and classification of stereoisomers of polypropylene during examination, it is sufficient to test them in accordance with the parameters given in tables-4.

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