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METHOD OF OBTAINING CURRENT-CONDUCTING POLYMER MATERIALS

by

L.K. Dereza, B.S. Tul'chinskiy

HUMAN TRANSLATION

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Block	Italic	Transliteration	Block	Italic	Transliteration
А а	*А а*	A, a	Р р	*Р р*	R, r
Б б	*Б б*	B, b	С с	*С с*	S, s
В в	*В в*	V, v	Т т	*Т т*	T, t
Г г	*Г г*	G, g	У у	*У у*	U, u
Д д	*Д д*	D, d	Ф ф	*Ф ф*	F, f
Е е	*Е е*	Ye, ye; E, e*	Х х	*Х х*	Kh, kh
Ж ж	*Ж ж*	Zh, zh	Ц ц	*Ц ц*	Ts, ts
З з	*З з*	Z, z	Ч ч	*Ч ч*	Ch, ch
И и	*И и*	I, i	Ш ш	*Ш ш*	Sh, sh
Й й	*Й й*	Y, y	Щ щ	*Щ щ*	Shch, shch
К к	*К к*	K, k	Ъ ъ	*Ъ ъ*	"
Л л	*Л л*	L, l	Ы ы	*Ы ы*	Y, y
М м	*М м*	M, m	Ь ь	*Ь ь*	'
Н н	*Н н*	N, n	Э э	*Э э*	E, e
О о	*О о*	O, o	Ю ю	*Ю ю*	Yu, yu
П п	*П п*	P, p	Я я	*Я я*	Ya, ya

*ye initially, after vowels, and after ъ, ь; e elsewhere.
When written as ё in Russian, transliterate as yё or ё.

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	$\sinh^{-1}$
cos	cos	ch	cosh	arc ch	$\cosh^{-1}$
tg	tan	th	tanh	arc th	$\tanh^{-1}$
ctg	cot	cth	coth	arc cth	$\coth^{-1}$
sec	sec	sch	sech	arc sch	sech^{-1}
cosec	csc	csch	csch	arc csch	csch^{-1}

Russian	English
rot	curl
lg	log

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METHOD OF OBTAINING CURRENT-CONDUCTING POLYMER MATERIALS

Dereza, L.K., Tul'chinskiy, B.S. [inventors]

The method is related to the technology of obtaining polymer materials which possess low electrical resistance.

A method is known for obtaining current-conducting polymers by means of hardening a suspension of a ferromagnetic filler, for example, carbonyl iron in an epoxy resin in a permanent magnetic field.

However, the high expenditure of the filler lowers the physicomechanical properties of the material, and materials obtained by such a method possess considerable specific electrical resistance.

The purpose of the invention is to improve ~~improving~~ the electrical conductivity of polymer compositions and lowering the expenditure of filler. KEYWORDS: USSR, Translations, Russian Language Patents, Plastics, Ferromagnetic Filler, Carbonyl Nickel (JG)

This is achieved by the simultaneous influence of a ferromagnetic filler in the polymer on the suspension: a magnetic field with a strength of 300±20 Oe, ultrasonic irradiation with a frequency of 400-440 kHz and a direction coinciding with the direction of the magnetic force lines, and an excess pressure of 0.3-0.5 atm (gage).

The strength of the magnetic field is selected such that the magnetic susceptibility of the ferromagnetic filler is maximum.

Since the formation of the "chains" takes place with the simultaneous directed action of ultrasonic oscillations, the magnetic field and the excess pressure on the particles, then the "packing" of the particles in the chains is maximum, which leads to a lowering of contact (transient) resistances.

Example 1. 82 parts by weight of ED-6 epoxy resin, 14 parts by weight of polyethylene polyamide, 12 parts by weight of dibutyl phthalate, and 20 parts by weight of powder of carbonyl nickel (PNK-1) are mixed thoroughly. The resulting suspension is poured into a mold made out of fluoroplastic (for facilitating the subsequent removal of the finished product) which is then placed between the poles of an electromagnet which is fed by direct current. The strength of the field is maintained on the level of 300 ± 20 Oe, since at this strength nickel has the maximum magnetic susceptibility. The composition is hardened at an excess pressure of 0.3-0.5 atm (gage), temperature of 40-50°C, and simultaneous exposure to ultrasound with a frequency of 400 kHz. An example of the source of this is the TsP-V1 type piezoelectric ultrasonic radiator. The direction of propagation of the ultrasound should coincide with the direction of the force lines of the magnetic field.

Sonication and the action of the magnetic field are continued up to the partial hardening of the composition (0.8-1.5 h). Such treatment leads to the formation of the optimal "chain" structure.

In the magnetic field the specific resistance of the resulting polymer is 0.1 (0.01) ohm/cm and the concentration of filler is 12% (20)%.

In the magnetic field following the action of the ultrasound and the excess pressure of 0.5 atm(gage) the specific resistance of the resulting polymer is 0.03 (0.0032) ohm/cm and the concentration of filler is 13 (22)%.

Example 2. 72 parts by weight of polyester resin of the PN-1 type, 4 parts by weight of isopropylbenzene hydroperoxide, 8 parts by weight of cobalt naphthenate and 15 parts by weight of PNK-1 carbonyl nickel are mixed thoroughly and poured into a mold made out of ftorlon-4 where hardening takes place.

Disturbing factors: strength of the magnetic field 300$\pm$10 Oe, excess pressure 0.4 kg/cm^2, frequency of sound 350 kHz. Temperature in the process of hardening 20-30^{o}C.

Example 3. 55 parts by weight of PN-3 polyester resin, 15 parts by weight of methyl methacrylate, 15 parts by weight of styrene, 1-2 parts by weight of cyclohexanol peroxide and 20 parts by weight of

powder of carbonyl nickel PNK-1 are mixed thoroughly and poured into a mold made out of ftorlon-4 where hardening takes place.

Disturbing factors: strength of the magnetic field 300±10 Oe, excess pressure 0.5 kg/cm^2, frequency of sound 300 kHz. Temperature in the process of hardening 50-60°C. Time of action of the disturbing factors 8-10 min.

Example 4. 25 parts by weight of latex polyvinyl chloride, 50 parts by weight of dibutyl phthalate, 1-2 parts by weight of calcium stearate and 12 parts by weight of powder of PNK-1 carbonyl nickel are mixed at 140-150°C after complete swelling of the resin in DBP. The thoroughly mixed suspension is poured into a mold made out of ftorlon-4 and placed in a magnetic field with simultaneous sonication. With cooling to 100-110°C the polymer is hardened.

Disturbing factors: strength of the magnetic field 300±10 Oe, excess pressure 0.4 kg/cm^2, frequency of sound 330 kHz. Time of action of the disturbing factors 12-18 min.

Example 5. 80 parts by weight of methyl methacrylate (monomer), 1-2 parts by weight of benzene peroxide, 1 part by weight of dimethylaniline and 12-15 parts by weight of powder of PNK-1 carbonyl nickel.

The components are mixed thoroughly and poured into a mold made out of ftorlon-4. The latter is placed in a thermostat and the melting point increased to 100°C.

Disturbing factors: strength of the magnetic field 300±10 Oe, excess pressure 0.3 kg/cm^2, frequency of sound 370 kHz. Action of disturbing factors - up to complete gelatinization of the composition.

Example 6. 10 parts by weight of FA furan resin, 20 parts by weight of graphite, 3 parts by weight of benzosulfonic acid and 15 parts by weight of powder of PNK-1 carbonyl nickel are mixed thoroughly and poured into a mold made out of ftorlon-4.

Disturbing factors: strength of the magnetic field 300±10 Oe, excess pressure 0.3 kg/cm^2, frequency of sound 350 kHz.

Object of invention

A method of obtaining current-conducting polymer materials by means of hardening a suspension of ferromagnetic filler, powder of carbonyl nickel in a polymer for example, in a permanent magnetic field. It is characterized by the fact that for the purpose of improving the electrical conductivity of polymer compositions and lowering the expenditure of filler the process of hardening is carried out with an excess pressure of 0.3-0.5 atm(gage) with simultaneous sonication of the suspension by ultrasound with a frequency of

400-440 kHz with an intensity lower than the threshold of onset of cavitation and a direction which coincides with the direction of the magnetic force lines.

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