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Title: NANOCOMPOSITE MATERIALS FOR COATING OF MOULDS

Page Range: T/1-6

Author(s): Holocher-Ertl M; Passler T

File size: 94K

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Journal: International Polymer Science and Technology

Issue Year: 2006

Volume: 33

Issue No: No. 6

Abstract

The use is discussed of nanocomposite materials as non-stick coatings for moulds for the production of rubber products. The technology has been developed by Gummiwerk Kraiburg for the production of tread strips for the retreading of truck tyres, and involves the use of the sol-gel process. Starting with various silanes and the appropriate controls, the sol-gel process leads to the formation of nano-scale particles, which, with the appropriate surface treatment, show a variety of properties, including the capacity for self-organisation. In this way, surface-modified nanoparticles with fluorinated groups can be enriched with air at the interfaces and acquire anti-adhesive surface properties. The technology is compared to previous techniques for mould coating, and results of trials by manufacturers of industrial rubber goods are tabulated. 5 refs. (Article translated from Gumi Fasern Kunststoffe, No.2, 2006, pp.91-5)

Title: INTERPHASE TENSION BETWEEN COMPONENTS OF THERMOPLASTIC BLENDS BASED ON RUBBER AND POLYOLEFINS FILLED WITH RUBBER CRUMBS

Page Range: T/7-11

Author(s): Babich V F; Perepelitsyna L N; Tolstov A L; Lipatov Y S

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Journal: International Polymer Science and Technology

Issue Year: 2006

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Volume: 33
Issue No: No. 6

Abstract

A study is presented of the interphase interaction of components of thermoplastic dynamic vulcanisates based on rubbers and polyolefins, and the influence upon it of compatibilising additives. Thermodynamic incompatibility supposes the formation of interfaces between the components in the formation of phase boundaries, characterised by interphase tension or specific interphase free energy. Methods of determining the solid-liquid boundary of blends comprising powdered rubber vulcanisate from recycled car tyres and LDPE are examined, and a formula is proposed which uses the value of the equilibrium wetting angle of the surface of the solid by the liquid. A measuring cell was developed for investigating the spread of a drop of molten polymer at elevated temperatures. In order to improve the compatibility of the filler with the binder, the introduction of a surfactant into the composition of the binder or surface treatment of the rubber crumb with a substance that acts as a promoter, is necessary. The bonding strength of the components could also be improved by increasing the mechanical pressure during mixing of the filler with the binder. 6 refs. (Article translated from *Kauchuk i Rezina*, No.4, 2005, p.7-11)

Title: LOW-FLAMMABILITY ELASTOMERIC HALOGENATED POLYBUTENES

Page Range: T/13-17

Author(s): Ronkin G M

File size: 63K



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Journal: International Polymer Science and Technology

Issue Year: 2006

Volume: 33

Issue No: No. 6

Abstract

The chemical modification of polybutene rubbers in order to improve flame resistance is discussed. An investigation was carried out into the synthesis of chlorinated, brominated, chlorobrominated, chlorosulphonated, bromosulphonated and chlorobromosulphonated modifications of polybutene, and an examination of the possibility of their application individually or in composites with other polymers as low-flammability materials. The halogenated polybutenes produced, were found to be saturated, highly elastic, rubber, highly functional, highly reactive polymers which are claimed to possess a unique combination of properties, including good adhesion to metals and fire resistance. 12 refs. (Article translated from *Kauchuk i Rezina*, No.4, 2005, p.11-14).

Title: USE OF CHLOROPRENE LATEX FOR THE IMPREGNATION OF NON-WOVEN MATERIAL

Page Range: T/19-20

Author(s): Dedov A V; Bokova E S

File size: 47K



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Journal: International Polymer Science and Technology

Issue Year: 2006

Volume: 33

Issue No: No. 6

Abstract

Non-woven materials, commonly used in the building, chemical and other sectors of industry can be improved with respect to mechanical strength and rigidity by their impregnation with polymer dispersions. An investigation was conducted on non-woven material made of polyester fibre, mechanically formed into a mat and

subsequently strengthened by needle punching and impregnation with chloroprene latex. The study examines the dependence of the physico-mechanical characteristics of the impregnated non-woven material on the content of chloroprene elastomer. The mechanical properties of the initial needle-punched material were assessed from the nominal tensile stress and breaking elongation. These properties are determined by the combination of the bond strength between the active load-bearing structural elements in the form of entanglements of fibres and their clusters, and the mobility of the elements themselves. The optimum properties of the impregnated non-woven materials were achieved with a rubber content of the material of the order of 50 wt. %. With the level of elastomer content, the mobility of the fibres and their clusters were found to be retained. 3 refs. (Article translated from *Kauchuk i Rezina*, No.4, 2005, p.14-6)

Title: SWELLING OF FILMS BASED ON CARBOXYLATED BUTADIENE LATEX SKD-1s IN SOLVENTS AND WATER

Page Range: T/21-24

Author(s): Shmurak I L

File size: 58K



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Journal: International Polymer Science and Technology

Issue Year: 2006

Volume: 33

Issue No: No. 6

Abstract

The rubber-to-textile bond strength in polyamide tyre cord-carboxylated butadiene latex adhesive structures is investigated. The bond strength is known to depend on the pH of the adhesive. From the degree of swelling in water and solvent of latex films formed on a substrate of fibre-forming polymer, it was possible to judge the interaction of the functional groups of the latex with this polymer, which, together with the modulus of the film, can determine the rubber-to-cord bond strength. This paper examines the pH dependence of the degree of swelling of films of carboxylated butadiene latex in solvents and water, and of latex-resorcinol-formaldehyde adhesives based on carboxylated butadiene latex in a solvent, and also the influence of treatment of the latex film with ammonia on change in its weight and degree of swelling. Amide groups, formed during the interaction of non-ionised carboxyl groups with ammonia, are shown to have a favourable effect on the rubber-to-cord bond strength, and it was shown that a reduction in the degree of ionisation of carboxyl groups in carboxylated butadiene latex promoted an increase in the rubber-to-impregnated cord bond strength. However, with the existing adhesive formulation, reduction in the degree of ionisation of carboxyl groups on carboxylated butadiene latex, led to a reduction in the adhesive's stability. A new formulation has therefore been developed, which, in addition, makes it possible to reduce formulation costs since it does not require the use of two latices. 7 refs. (Article translated from *Kauchuk i Rezina*, No.4, 2005, p.16-18)

Title: EFFECT OF COBALT STEARATES AND COBALT OLEATES ON THE BOND STRENGTH OF A RUBBER-METAL CORD SYSTEM

Page Range: T/25-27

Author(s): Rakhmatullina A P; Portnoi T B; Akhmed'yanova R A; Liakumovich A G

File size: 55K



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Journal: International Polymer Science and Technology

Issue Year: 2006

Volume: 33

Issue No: No. 6

Abstract

The development of new adhesion promoters for use in the bonding of metal tyre

ords to rubbers to provide wet ageing resistance, is discussed. In Russia, the problem of debonding has been approached by the use of organic cobalt salts such as Disolen K and Manobond 680s (co-B-acylate) into the breaker rubber formulation. However, under conditions of wet ageing, the adhesive properties of the rubber-metal cord system decreased owing to corrosion under the influence of ammonia released by the modifier RU. Earlier work is claimed to have established that a mixture of oleic and stearic acids in a 60:40 mass ratio led to a synergistic effect of a number of properties of tread rubbers. This investigation, therefore, examines the influence of the ratio of oleic and stearic acid residues in the cobalt salts on their activity as adhesion promoters. Tests on cobalt salts were conducted in the formulation of a breaker rubber mix based on a combination of natural rubber and polyisoprene. Manobond 680s was used as the control adhesion promoter. The molecular compound formed, was more readily compatible with rubber and promoted better dispersion of carbon black. The improvement in adhesion properties of vulcanisates containing dystectic cobalt salts indicates its effectiveness as an adhesion promoter in rubber-to-brass-coated metal cord. 6 refs. (Article translated from *Kauchuk i Rezina*, No.4, 2005, p.23-24)

Title: NEW ESTER PLASTICISER BASED ON ALCOHOL PROCESSING PRODUCTS

Page Range: T/29-31

Author(s): Shutilin Y F; Dankovtsev V A; Grebennikova O I; Shrainer M V

File size: 44K



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Journal: International Polymer Science and Technology

Issue Year: 2006

Volume: 33

Issue No: No. 6

Abstract

The need for non-toxic renewable natural materials as ingredients of rubber mixes is addressed by the use of new chemical additives of a polyfunctional nature, based on the by-products of alcohol production. The replacement of commercial alcohols with these by-products in the synthesis of ester plasticisers would broaden the feedstock based and reduce the cost of the plasticisers obtained. The new plasticisers would comprise chiefly a mixture of phthalates of different structures. Their performance properties were tested in standard formulations based on butadiene-acrylonitrile rubbers, and results are given and discussed. Higher elastic properties in vulcanisates produced with the addition of the new plasticiser compared to those in which dibutyl phthalate was used, were noted. 6 refs. (Article translated from *Kauchuk i Rezina*, No.4, 2005, p.25-6)

Title: GAS-FILLED MATERIAL BASED ON BUTADIENE-ACRYLONITRILE AND BUTADIENE-STYRENE RUBBERS AND PVC

Page Range: T/33-36

Author(s): Vikhireva N P; Mel'nik L A; Podnebesnyi A P; Tereshchenko N M

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Journal: International Polymer Science and Technology

Issue Year: 2006

Volume: 33

Issue No: No. 6

Abstract

This article discusses the optimum formulation of a gas-filled material based on a blend of butadiene-acrylonitrile and butadiene-styrene rubbers and PVC. Since the ratio of the polymer base components has a considerable influence on the properties of the gas-filled material, a study was made of the influence of the ratio of three components on its physicomechanical properties. The choice of vulcanising group is

also considered and work was carried out to determine the optimum amounts and ratios of sulphur and guanide F. Results of trials indicated that the best combination of properties could be achieved with a PVC/butadiene-acrylonitrile/butadiene-styrene ratio of 100: 40: 20, and with a ratio of sulphur and guanide F of 1:1. 9 refs. (Article translated from *Kauchuk i Rezina*, No.4, 2005, p.27-9)

Title: DEVELOPMENT OF A NEW DESIGN OF SAFETY TYRE

Page Range: T/37-40

Author(s): Yusupov A A; Veselov I V; Yurtsev L N; Sokolov S L

File size: 178K

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Journal: International Polymer Science and Technology

Issue Year: 2006

Volume: 33

Issue No: No. 6

Abstract

This work describes the development of a radial safety tyre which on sudden loss of internal pressure, is capable of working at atmospheric pressure in the tyre cavity, with retention of the profile and dimensions of a pneumatic tyre with practically the same mass. This was achieved by replacing strands of the carcass with elastic elements taking up the radial load on the tyre. The elastic elements of the carcass have the profile shape of the inflated tyre given to them on a special template. The breaker was manufactured from the same material as the elastic elements of the carcass, and was arranged in the circumferential direction. A reinforcement method was developed and certified on model specimens. Details are given of the testing and development of procedures for calculating the performance of safety tyres with elastic elements in the carcass. 5 refs. (Article translated from *Kauchuk i Rezina*, No.4, 2005, p.33-6)

Title: IMPORTANCE OF ASSESSING THE WEAR RESISTANCE OF COVERING RUBBERS FOR CONVEYOR BELTS

Page Range: T/41-42

Author(s): Golikov G F

File size: 57K

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Journal: International Polymer Science and Technology

Issue Year: 2006

Volume: 33

Issue No: No. 6

Abstract

The wear resistance of rubber covers for conveyor belts is the main factor determining the durability of the belt. Currently Russian belt producers are reported to take account only of the thickness of the rubber cover. Data are presented which indicate the effect of various qualities of rubbers on durability in moderate, heavy duty and very heavy duty service conditions. Tests were carried out on rubber-fabric belts with covers manufactured from rubbers with a tensile strength of 10-25 MPa, a tear strength off 50-120 kN/m, and a breaking elongation of 400-590%. Using a proposed equation, the dependence of rubber wear on belt service time was established. 7 refs. (Article translated from *Plasticheskie Massy*, No.4, 2005, p.36-7)


Title: REDUCED-COMBUSTIBILITY RUBBER MIX BASED ON ETHYLENE-PROPYLENE-DIENE RUBBER AND BUTYL RECLAIM

Page Range: T/43

Author(s): Markov V V; Alifanov E V; Reznichenko S A; Kornev A E; Kukushkin Y V

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Journal: International Polymer Science and Technology

Issue Year: 2006

Volume: 33

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Abstract

A rubber mix has been developed for use in reinforced roll roofing materials, which does not require vulcanisation, and which is characterised by reduced combustibility. It is based on EPDM and butyl reclaim. The properties of the developed rubber mix are given, together with brief details of the results of fire resistance testing. A trial batch of roofing material reinforced with glass fabric has been produced and according to the results of an assessment carried out at the All-Russia Scientific Research Institute of Firefighting, the material has been assigned to flammability group G-2. Since the rubber requires no vulcanisation, the production process and costs are simplified and reduced. 1 ref. (Article translated from *Plasticheskie Massy*, No.4, 2005, p.43-4)


Title: EFFECT OF A STEADY MAGNETIC FIELD ON THE STRENGTH, DIELECTRIC, AND MAGNETIC PROPERTIES OF COMPOSITES

Page Range: T/45-48

Author(s): Ramazanov M A; Kerimli S D; Sadykhov R Z

File size: 62K

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Journal: International Polymer Science and Technology

Issue Year: 2006

Volume: 33

Issue No: No. 6

Abstract

A steady magnetic field is known to have a considerable influence of the deformation properties of polymers and composites based on them. In magnetic composite materials, the magnetic characteristics depend on the volume fraction, size and shape of the particles of the magnetic components, and their spatial arrangement within the dielectric. In ferrite-filled composites, an important contribution to magnetic permeability is also made by the degree of magnetic texture of the material, owing to the strong magnetic anisotropy of the composites. This work studies the effect of the volume content of the components in composites based on HDPE- and PVDF-ferromagnetic substances, the polarity of the polymers, and the magnetic field on the strength, magnetic and dielectric properties of the composites. Composites were obtained by hot pressing the magnetic additives and HDPE or PVDF at the melting temperature of the matrix. The composites were treated in a steady magnetic field of 2.4 kerg strength over a 0.5 h period. Changes in mechanical strength after this treatment were attributed to the polarisation of magnetic particles as a result of which, disordering of the structure occurred, resulting in a change in strength, dielectric and magnetic properties. 9 refs. (Article translated from *Plasticheskie Massy*, No.10, 2005, p.5-7)


Title: THE INFLUENCE OF THE CONCENTRATION, PREPARATION CONDITIONS, AND DEGREE OF INTERACTION OF MOLECULES ON THE STRUCTURE OF COMPOSITES OF PVC WITH BUTADIENE-ACRYLONITRILE ELASTOMERS

Page Range: T/49-52

Author(s): Tkhakakhov R B; Begretov M M; Tkhakakhov E R; Zavoda A A; Zhazaeva E M; Karamurzov B S

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Journal: International Polymer Science and Technology

Issue Year: 2006

Volume: 33

Issue No: No. 6

Abstract

The properties of multi-component polymer systems are determined by their morphology, in the formation of which, an important role is played by the chemical structure, supermolecular organisation of the individual components, and the interaction of molecules of various polymers at the phase boundary. This work investigates the morphology of PVC and butadiene-acrylonitrile rubber blends with different preparation methods, variation in the concentration of components, and in the degree of molecular interaction of the components. Particular consideration is given to the influence of the mixing temperature on the distribution of the components and control of dielectric properties. 23 refs. (Article translated from *Plasticheskie Massy*, No.10, 2005, p.7-9).


Title: STUDY OF THE PROCESSES OF STRUCTURE FORMATION OF SILICONE OLIGOMERS AND THEIR EFFECT ON THE PROCESSING PROPERTIES OF RUBBER COMPOSITES

Page Range: T/53-58

Author(s): Faterov S A; Kostromina N V; Osipchik V S

File size: 106K

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Volume: 33

Issue No: No. 6

Abstract

The use of high-intensity methods for the processing of plastics and elastomers is discussed. Such changes in processing techniques require a consideration of the effect of the processing on the processability of materials and a retention of required properties. Particular consideration is given to the rheological characteristics. In order to prevent deterioration of material properties, and to ensure the effective processing, the effect of silicone oligomers with different functional groups was studied with respect to their effect on the processing properties of silicone rubber composites. The investigation was conducted on a rubber composites based on polymethylvinylsiloxane rubbers from two different manufacturers. The modifiers were polymethylsiloxane liquids of different molecular weights, divinyl rubber of different molecular weights, and low molecular weight polydimethylsiloxane rubber. The rheological processing properties were investigated on a plastomer and Monsanto rheometer. The degree of vulcanisation of the rubber was studied by equilibrium swelling, and physicomechanical testing was carried out. 5 refs. (Article translated from *Plasticheskie Massy*, No.10, 2005, p.16-9).


Title: MECHANICAL RELAXATION PROPERTIES OF POLYURETHANE ISOCYANURATE POLYMERIC MATERIALS

Page Range: T/59-65

Author(s): Luchkina L V; Bychko K A; Kovriga O V; Markov V A; Askadskii A A

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Journal: International Polymer Science and Technology

Issue Year: 2006

Volume: 33

Issue No: No. 6

Abstract

Recent research into the structure and properties of polyisocyanurate networks consisting of bulky crosslinked points and flexible and short polymer chains connecting these points, has led to the development of polymeric materials with properties differing considerably from those of known materials. The elastic modulus of the networks obtained changes in an extremely wide range with moduli ranging from those characteristic of polymer glasses to those characteristic of soft rubber. In this work, the structure of polymer networks was modified in such a way that, besides polyisocyanates, the material also contained polyurethane in different ratios. Polyurethane isocyanurate materials were obtained by reactions of the polycyclotrimerisation of oligoester diisocyanate and TDI, and by the migration polymerisation of macrodiisocyanate and diamine. Bulk casting and compression moulding were used to obtain the materials. The crosslinked materials were investigated with respect to stress relaxation, thermomechanical properties, and stress-strain relationships. The limiting stage of the relaxation process was determined. It was established that the materials obtained possessed elastic rather than viscoelastic properties, although their elastic moduli are the same as in the transition zone from the glassy to the rubbery state, which is claimed to distinguish them from all known polymeric materials. 10 refs. (Article translated from *Plasticheskie Massy*, No.10, 2005, p.19-24)

Title: METHODS OF FORECASTING CHANGES OF THE PROPERTIES OF POLYMERIC PRODUCTS

Page Range: T/67-75

Author(s): Jachowicz T; Sikora R

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Journal: International Polymer Science and Technology

Issue Year: 2006

Volume: 33

Issue No: No. 6

Abstract

Changes in the properties of polymeric materials due to conditions of ageing are discussed with reference to the methods used with which to forecast such changes. Types of ageing are examined, and phenomena associated with the ageing of materials are described. Use of natural and accelerated ageing tests are considered, and it is claimed that methods of accelerated ageing are not adequate to assess the phenomena occurring in polymeric materials, and that they do not give a complete picture of the actual ageing process. The use of mathematical methods as a basis for prediction is examined, and includes the use of the Arrhenius equation, an analysis of distribution of a random variable, regression analysis and prediction on the basis of a time series. 50 refs. (Article translated from *Polimery*, No.3, 2006, p.177-85).

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