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Properties and testing of nonwovens

00001
PI: 20200837 JA: 0201
TI: Factors which influence the reliability of the assessment of interfacial bonding in fibrous composites using the pull-out test
AU: Yue C Y; Looi H C
JN: Int. J. Adhes. Adhes. $IS=0143-7496
CI: vol. 21, no. 4, 2001, pp 309-323 (P)
CT: BONDING STRENGTH/ COMPOSITE MATERIAL/ INTERFACE/ TEST METHOD/
AB: Expressions have been devised to determine the interfacial shear strength (IFSS), the interfacial frictional shear stress and the maximum pull out load for a fibrous composite using a strength based pull out model which assumes a minimum stress criterion for debonding at the fibre-matrix interface under restrained-top condition (RTC) and fixed-bottom condition (FBC) configurations. In order to provide experimental verification for the model, single fibre pull out tests were conducted using composite materials consisting of polypropylene/glass fibre, epoxy/glass fibre, epoxy/stainless steel and silicone rubber/glass fibre under both FBC and RTC configurations. The maximum load was determined from the force /displacement curve. Plots of maximum pull out load against fibre embedded length (L) showed good agreement with the predictions of the model. (13 fig, 2 tab, 16 ref)
SO: B

00002
PI: 20203031 JA: 0202
TI: Nonwoven geotextile-sabkha and -sand interface friction characteristics using pull-out tests
AU: Aiban S A; Ali S M
JN: Geosynthetics Int. $IS=1072-6349

CI: vol. 8, no. 3, 2001, pp 193-220 (P)
CT: DEFORMATION/ FRICTION/ GEOTEXTILE/ SAND/
AB: A study was undertaken of Sabkha soil, which occurs in large quantities along the Arabian Gulf and Red Sea coasts. Experiments were conducted to measure the frictional characteristics of sand-geotextile-sand and Sabkha-geotextile-sand interfaces and to compare the pull out resistance of locally available nonwoven geotextiles. High tensile strength geotextiles require a large pull out force in the case of the sand-geotextile-sand interface, whereas the least extensible geotextile requires the maximum pull-out force in the case of the Sabkha-geotextile-sand interface. At any point on the geotextile, the stresses during a pull out test are dependent on the strain produced at that point. The properties of a geotextile to be considered include surface texture, permeability, tensile strength and elongation at rupture. Longer lengths of geotextiles should be used during tests to enable adequate study of lateral earth pressure, shear strength and necking. Necking was more pronounced in geotextiles of lower tensile strength. Shear stresses mobilised on the sabkha-geotextile interface were improved by partial soaking. The interface interaction factor depends on confining pressure, geotextile type, soil type and relative displacement at the interface. For sabkha soils, geotextiles with low extensibility are preferred. (20 fig, 5 tab, 36 ref)
SO: B

00003
PI: 20203575 JA: 0202
TI: Transport properties of electrospun non woven membranes
AU: Schreuder-Gibson H L; Gibson P; Hsieh Y-L
CI: INTC 2001 - International Nonwovens Technical Conference, Baltimore, MD, USA, 5-7 Sept. 2001, 10pp <Atlanta, GA, USA: TAPPI Press, 2001, USD175.00, CD-Rom> (K, P, S)
CT: CONFERENCE/ GAS PERMEABILITY/ NONWOVEN INDUSTRY/ POLYURETHANE/ VAPOUR BARRIER/ WATER VAPOUR PERMEABILITY/
CN: Association of the Nonwoven Fabrics Industry; TAPPI
AB: Thermoplastic polyurethane (TPU) elastomers were electrospun into thin nonwoven webs resembling microporous membranes then evaluated for applications such as protective membranes for textiles. Crosslinkable TPU from Noveon was used in a comparative study with an experimental carboxylated Estane product: Sanres also from Noveon. Uncarboxylated Estane; meltblown Estane and electrospun Estane were also used. Transport of gas, vapour, liquids and solids through such solids was examined. Electrospinning produced a fine nonwoven having many of the transport features of microporous membranes. Liquid transport through membranes was significantly decreased by crosslinking fibres of electrospun membrane. Water transport through structure was increased by combining electrospun and meltblown nonwovens of identical materials. Airflow resistance and aerosol protection of fabrics such as meltblowns is also increased by addition of electrospun layers without affecting breathability. (5 fig, 5 tab, 18 ref)
SO: B

00004
PI: 20203586 JA: 0202
TI: Stretch, recovery, compressive behaviour and property tradeoffs for hydroentangled

fabrics of poly(trimethylene terephthalate) staple
AU: Shiffler D A; Hwo C C
CI: INTC 2001 - International Nonwovens Technical Conference, Baltimore, MD, USA, 5-7 Sept. 2001, 24pp <Atlanta, GA, USA: TAPPI Press, 2001, USD175.00, CD-Rom> (K, P, S)
CT: COMPARISON/ COMPRESSIBILITY/ CONFERENCE/ NONWOVEN INDUSTRY/ NYLON/ PET/ POLYETHYLENE TEREPHTHALATE/ POLYTRIMETHYLENE TEREPHTHALATE/ RECOVERY/ STRETCH/
CN: Association of the Nonwoven Fabrics Industry; TAPPI
AB: Nonwovens were produced from polytrimethylene terephthalate (PTT), an emerging new commercial polyester being marketed by Shell, and conventional nonwoven material such as polyethylene terephthalate (PET) and polyamide (Nylon 6). Nonwovens were produced using bonding techniques such as hydroentangling, thermal and needlepunch. PTT has inherent low fibre bending rigidity in hydroentangled fabrics and exhibits characteristics such as significant break strength at low specific energy. Flexile rigidity does not increase with specific energy and significant tear strength develops at 1,600kJ/kg. for all fibres tested load at 10% strain increased with increasing specific energy with PTT having higher L10 due to better bonding, higher tensile, tear and recovery. All fibres tested showed recovery from 10% strain increasing with specific energy however PTT had significant recovery in both low and high aperture fabrics. Bulk at 1kPa pressure increased with specific energy, reaching a plateau at 4,000kJ/kg. PTT/PET 50:50 exhibited the highest bulk compared to other fibres. The softness factor decreased with increasing specific energy, differences between fabrics were small with PTT exhibiting the lowest softness. PET/PTT bends exhibited a small compressive advantage with regard to fabric recovery from compression. (29 fig, 13 tab, 14 ref)
SO: B

00005
PI: 20203591 JA: 0202
TI: Determining basis weight uniformity in nonwovens. Part 1: off-line methods
AU: Pourdeyhimi B; Kohel L
CI: INTC 2001 - International Nonwovens Technical Conference, Baltimore, MD, USA, 5-7 Sept. 2001, 8pp <Atlanta, GA, USA: TAPPI Press, 2001, USD175.00, CD-Rom> (K, P, S)
CT: CONFERENCE/ GRAMMAGE/ IMAGE ANALYSIS/ NONWOVEN INDUSTRY/ TEXTURE/
CN: Association of the Nonwoven Fabrics Industry; TAPPI
AB: Strategies can be developed to characterise nonwoven fabrics offline. Image analysis techniques have been used to define the variation of mass (basis weight) in paper and nonwoven webs to determine whether the appearance of a sample will correlate with mass uniformity. The study also aimed to investigate how an automated system could process texture information and also what features are most important to the eye/brain system of the consumer. Basis weight non uniformity results in a blotchy or patchy appearance and variations in local density of the image. A flatbed scanner was used to obtain images measuring at least 400sq cm. Simulated images were composed of fuzzy circular objects related to the number of dots. All images were digitised and subjected to statistical analysis techniques for spatial analysis. The study has application in the development of affordable sensors for process measurements. (8 fig, 10 ref)
SO: B

00006
PI: 20203598 JA: 0202
TI: The effect of polymer types and fibrous structure on the thermal insulation properties of nonwoven mats
AU: Tsai P P; Anderson G; Tseng B C
CI: INTC 2001 - International Nonwovens Technical Conference, Baltimore, MD, USA, 5-7 Sept. 2001, 6pp <Atlanta, GA, USA: TAPPI Press, 2001, USD175.00, CD-Rom> (K, P, S)
CT: COMPRESSION/ CONFERENCE/ MAT/ NONWOVEN INDUSTRY/ PET/ POLYETHYLENE TEREPHTHALATE/ POLYPROPYLENE/ THERMAL PROPERTIES/
CN: Association of the Nonwoven Fabrics Industry; TAPPI
AB: The effect of thermal properties of polypropylene (PP) and polyethylene terephthalate (PET), and fibrous structure on through air bonded PET mats and PET injected meltblown PP mats was investigated. Changes of thickness by compressing the same weight of carded PET and melt blown mats had a significant impact on thermal resistance. There was a reduction in heat resistance through the mat following compression and thickness reduction. There was little difference between PET and PP in thermal conductivity and packing density. For lower packed mats the R value, the theoretical overall heat resistance through the mat based on fibre and air conductivities, did not have a good agreement with measured data. This was attributed to the important role of convection in heat transfer. There was improved correlation for higher packed mats where heat transfer by convection was reduced. (1 fig, 4 tab)
SO: B

00007
PI: 20203602 JA: 0202
TI: Determining latent formaldehyde in fibreglass mat
AU: Wertz S
CI: INTC 2001 - International Nonwovens Technical Conference, Baltimore, MD, USA, 5-7 Sept. 2001, 7pp <Atlanta, GA, USA: TAPPI Press, 2001, USD175.00, CD-Rom> (K, P, S)
CT: CONFERENCE/ FORMALDEHYDE/ MAT/ NONWOVEN INDUSTRY/ TEST METHOD/ UREA FORMALDEHYDE/
CN: Association of the Nonwoven Fabrics Industry; TAPPI
AB: A new technique for determining the amount of formaldehyde released from a fibreglass mat upon addition of hot substrate has been designed for ease of use in a fibreglass mat plant. The method can be used to determine differences in formaldehyde odour in mat due to differences in binder or type of mat. The method involves addition of sodium sulphite to an aqueous extract from the fibreglass mat and titration with thymolphthalein. The technique takes 1h to run in triplicate using equipment occurring in most glass mat plants and without hazardous chemicals. The method involves partial hydrolysis of urea formaldehyde (UF) resin leading to a measurement of six to eight times more formaldehyde release. Compared to a tube furnace or traditional hot air techniques, the method yields more formaldehyde and demonstrates that less formaldehyde fumes at coater are yielded by mats with a greater degree of cure from the use of larger quantities of catalyst. (4 fig, 1 tab)
SO: B

00008
PI: 20203604 JA: 0202
TI: Needlepunched nonwovens from cotton fibres for absorbent products
AU: Zamfir M; Kiekens P
CI: INTC 2001 - International Nonwovens Technical Conference, Baltimore, MD, USA, 5-7 Sept. 2001, 10pp <Atlanta, GA, USA: TAPPI Press, 2001, USD175.00, CD-Rom> (K, P, S)
CT: ABSORPTIVITY/ CONFERENCE/ COTTON/ NEEDLEPUNCHED NONWOVEN/ NONWOVEN INDUSTRY/
CN: Association of the Nonwoven Fabrics Industry; TAPPI
AB: The use of absorbent nonwoven products made from cotton fibres in band form and bonded by needlepunching process was studied. A process similar to cotton spinning involving feeding, blending, opening, carding, reuniting, superposition and needlepunching was adopted to obtain cotton fibrous webs. Modification or destruction during needlepunching did not impact on the structure of the woven insertion. There was no significant breaking of needles during needlepunching. The absorption speed to the nonwoven products was comparable to that of products produced by SCA, Molnlycke, Procter and Gamble, Rauscher and Pelz. The gauze woven fabric used as support was not destroyed during the process. Needlepunching parameters influenced average weight and absorption characteristics. (7 fig, 4 tab, 8 ref)
SO: B

00009
PI: 20203611 JA: 0202
TI: Compressibility of perpendicular-laid fabrics containing cotton
AU: Parikh D V
CI: INTC 2001 - International Nonwovens Technical Conference, Baltimore, MD, USA, 5-7 Sept. 2001, 18pp <Atlanta, GA, USA: TAPPI Press, 2001, USD175.00, CD-Rom> (K, P, S)
CT: BIODEGRADATION/ CONFERENCE/ NONWOVEN INDUSTRY/
CN: Association of the Nonwoven Fabrics Industry; TAPPI
AB: Perpendicular laid fabrics are new types of highloft textile materials which are used in the manufacture of filling materials in vehicles, cushioned furniture and mattresses, and in thermal insulation for bedding and clothing. Highloft perpendicular laid fabrics made with cotton, polyester and bicomponent bonding fibres exhibit higher compressional resistance and superior recovery properties to cross laid fabrics. Experiments were conducted using both perpendicular laid and cross laid fabrics produced using cotton, polyethyleneterephthalate (PET) and bicomponent copolyester bonding fibres. Twenty percent by weight bonding fibre of copolyester was used in all nonwovens whilst cotton content was varied and the percentage of PET adjusted to 100%. The superiority of perpendicular laid fabrics was attributed to the upright structure of perpendicular layering. Low level cotton blends had compresssional behaviour similar to synthetic fibre fabrics. There is potential application in perpendicular laid market for cotton waste lints since these have economic advantage in costing about half that of PET fibres or raw cotton. Lint fibres also have environmental advantage of biodegradability. (6 fig, 12 tab, 16 ref)
SO: B

00010
PI: 20203612 JA: 0202
TI: Introduction of plastic net scrim to alter the properties of a hydroentangled non-woven
AU: Misukanis K; Dorumsgaard T
CI: INTC 2001 - International Nonwovens Technical Conference, Baltimore, MD, USA, 5-7 Sept. 2001, 6pp <Atlanta, GA, USA: TAPPI Press, 2001, USD175.00, CD-Rom> (K, P, S)
CT: CONFERENCE/ HYDROENTANGLEMENT/ NETTING/ NONWOVEN INDUSTRY/ PET/ POLYETHYLENE TEREPHTHALATE/ SCRIM/ STRENGTH PROPERTIES/
CN: Association of the Nonwoven Fabrics Industry; TAPPI
AB: Plastic net scrim has been used as nonwoven reinforcement to impreve tensile strength since the 1960s. The effect of plastic netting on tensile strength, tear strength and air permeability properties of a polyethylene terephthalate (PET) hydroentangled composite were investigated. Experiments analysed 7 three layer laminate composites. The netting had a positive influence on strength and elongation to break of the carded composite in the machine direction, whilst in the cross direction major strength parameters of the composite followed the stress/strain curve of netting control. Introduction of the net into the nonwoven resulted in enhanced tear strength in cross direction but both nonwoven and netting were stronger and untearable in machine direction resulting in cross directional tear. The major factor in pressure differential was nonwoven weight and test results were not due to addition of netting. The introduction of plastic netting into nonwovens enables engineers to manufacture a composite having increased strength, dimensional stability, resiliency and reduced costs. there is also potential to enhance specific properties with regard to machine or cross machine directions. (13 fig, 1 tab, 2 ref)
SO: B

00011
PI: 20203613 JA: 0202
TI: Rapid morphology (property) changes at bond edge in thermal point-bonded nonwovens
AU: Michielsen S; Wang X
CI: INTC 2001 - International Nonwovens Technical Conference, Baltimore, MD, USA, 5-7 Sept. 2001, 5pp <Atlanta, GA, USA: TAPPI Press, 2001, USD175.00, CD-Rom> (K, P, S)
CT: BIREFRINGENCE/ CONFERENCE/ FAILURE MODE ANALYSIS/ MORPHOLOGY/ NONWOVEN INDUSTRY/ RAMAN SPECTROSCOPY/
CN: Association of the Nonwoven Fabrics Industry; TAPPI
AB: Raman microspectroscopy has been used to determine the morphology of polymers in vicinity of bond edge of thermal point bonded nonwovens to explain failures originating at the bond edge. Birefringence of fibres was shown to decrease by about 50% over a distance of one fibre diameter at the bond edge and correlates with the observed rapid decrease in the strength of fibres in this region. The failure mechanism of thermal point bonded nonovens is explained by qualitative polymer physics. Bond formation requires polymer chain segments to be released from crystals through partial melting. Such segments diffuse across the fibre/fibre interface and entangle with chain

segments from the opposing fibre. This rapid loss of molecular orientation from bridging fibres into bond depends on processing conditions. (3 fig, 4 ref)
SO: B

00012
PI: 20203614 JA: 0202
TI: Prediction of performance in thermally pointed bonded nonwovens
AU: Kim H S; Pourdeyhimi B; Desai P
CI: INTC 2001 - International Nonwovens Technical Conference, Baltimore, MD, USA, 5-7 Sept. 2001, 8pp <Atlanta, GA, USA: TAPPI Press, 2001, USD175.00, CD-Rom> (K, P, S)
CT: CONFERENCE/ FIBRE PROPERTIES/ MATHEMATICAL MODEL/ NONWOVEN INDUSTRY/ STRENGTH PROPERTIES/
CN: Association of the Nonwoven Fabrics Industry; TAPPI
AB: A mechanics based model was developed to extend previous work by Mi and Batra predicting the stress strain behaviour for certain point bonded geometries, taking into account structure and fibre properties. Recent development has made it applicable to various bond properties. The input parameters required are: fibre orientation distribution; bond properties including size, shape and spatial details; fibre properties, including fibre dimensions, stress/strain data; and debonding fibre. The first two parameters are provided by an image simulation technique. A simulated image was designed using variables of web density, fibre properties such as denier, crimp and thickness, unit cell size and bond properties such as size, shape and pattern. Fibre stress/strain data are provided from tests performed on a tensile testing machine. The model was applied to an example of different fibre strengths. Using stronger fibre, web modulus and failure stress increase. Elongation at maximum stress decreases when stronger fibre is used. (8 fig)
SO: B

00013
PI: 20203617 JA: 0202
TI: Evaluation of hand characteristics of nonwoven fabrics using simple methods
AU: Ramkumar S S
CI: INTC 2001 - International Nonwovens Technical Conference, Baltimore, MD, USA, 5-7 Sept. 2001, 7pp <Atlanta, GA, USA: TAPPI Press, 2001, USD175.00, CD-Rom> (K, P, S)
CT: CONFERENCE/ NONWOVEN INDUSTRY/
CN: Association of the Nonwoven Fabrics Industry; TAPPI
AB: A study was conducted into the surface mechanical properties of a set of needlepunched nonwoven fabrics to evaluate the suitability of a sliding friction apparatus to evaluate the frictional properties of nonwoven fabrics. The study was conducted over a range of normal loads and the observed frictional properties were characterised using a frictional parameter introduced by Ramkumar et al and the material/friction index. The values of the latter suggested that the simple Amontons' law is not valid for nonwoven fabrics and it was therefore illogical to identify frictional properties using a coefficient of friction. The sliding friction apparatus proved reliable in the evaluation of the frictional properties of nonwoven fabrics. The apparatus can be fitted to any universal tensile tester. Investigations were also conducted into the feasibility of using a

nozzle apparatus to evaluate the hand related characteristics of nonwoven fabrics. A steel nozzle of 3.14sq cm was fabricated and mounted on a tensile tester. A circular nonwoven specimens was pulled through the nozzle. The preliminary results showed that the method has good potential. (2 fig, 2 tab, 4 ref)
SO: B

00014
PI: 20205125 JA: 0203
TI: Fabric properties
AU: Holliday T
JN: Nonwovens Ind. $IS=0163-4429
CI: vol. 32, no. 12, Dec. 2001, pp 24-25 (C, P)
CT: END USE/ FABRIC/ FIBRE PROPERTIES/ NONWOVEN INDUSTRY/ PROPERTIES/
AB: An understanding of fibre properties and resulting fabrics can determine the future success of a nonwovens producer. The producer's ability to meet market demands depends on facilities, equipment, raw materials, expertise and marketing. Various developments in nonwovens are reviewed, which have been developed in response to specific customer needs. These include a clothing fabric providing stability for decorative stitching, car seat belt materials with controlled elongation properties, and a material for jogging clothes which transports perspiration to an absorbent cotton outer surface. Nonwovens with added benefits include those with charge-holding fibres used in filtration and floor coverings, with fibres containing biocides, and with hollow, dissolving or optical fibres.
SO: B