Nylon 66 composite and preparation method thereof
CN 102732018 B

ABSTRACT translated from Chinese

The present invention discloses a nylon 66 composition and preparation methods, specific formulations composed as follows: Nylon PA66: 40-80wt%; inorganic filler: 10-40wt%; nano-ceramic powders: 10-20wt%; Antioxidant: 0-1wt%; colored pigments: 0-5wt%; and lubricating additives: 0-0.5wt%. Nylon 66 group composition of the invention by adding nano-ceramic PA66 nylon powder, obtained better rigidity effect. High temperature nylon 66 composition process of the present invention uses a screw extrusion or hot forming, the process is simple.

DESCRIPTION translated from Chinese

Nylon 66 composition and its preparation method

Technical Field

[0001] The present invention belongs to the field of polymer chemistry materials, particularly to a nylon 66 composition and preparation methods.

Background technique

[0002] Nylon 66 has excellent heat resistance, chemical resistance, strength and easy to process, and thus in the automotive industry, electronics industry, and so on have a wide range of applications. In order to improve the physical and mechanical properties of nylon 66, the nylon 66 composition is added with inorganic fillers, such as talc, mica, kaolin, etc., at a certain proportion. Talc, mica, kaolin, etc. are used to improve the mechanical properties of nylon 66, but these inorganic fillers have poor compatibility with nylon 66 matrix, resulting in poor interfacial adhesion and easy to cause powdering problem. Therefore, in order to improve the compatibility and dispersion of the inorganic fillers, the nylon 66 composition is added with nano-ceramic powders, and nano-ceramic powders can be divided into nano-oxide ceramic powders, nano-carbon ceramic powders, ceramic powders, etc.

A nylon 66 composition composed as follows: PA66: 50-80wt%; inorganic filler; nano-ceramic powders: 10-2 (^ 1:%; Antioxidant: 0-1wt%; colored pigments: 0-5wt%; and lubricating additives: 0-0.5wt%; the nano-ceramic powder including nano ZrO2 ceramic powders, nano Al2O3 ceramic powders, nano 3Y-TZP ceramic powders or nano PTCR ceramic powder; the said nano-ceramic powder particle size 1-100 nm.

According to claim 1, wherein the composition is nylon 66, characterized in that: the inorganic filler include talc, mica, or kaolin, 300-500 mesh particle size.
mechanical equipment and large number of applications daily.

[0003] PA66 conventional compositions, in order to improve its rigidity, usually by the addition of an inorganic filler such as talc, mica, kaolin, etc., by the addition of an inorganic filler plays nucleation, so that crystallinity of the nylon 66 composition is increased. However, talc, mica or kaolin in the amount of improvement in the use of nylon 66 composition of large and rigid to improve ineffective.

DISCLOSURE

[0004] In view of the above, the present invention is necessary to provide a good rigidity of the nylon 66 compositions.

[0005] The technical solution of the present invention which is: A nylon 66 composition which comprises the following weight percent proportions of components:

[0006] PA66: 50-80wt%

[0007] The inorganic filler: 10-40wt%;

[0008] The nano-ceramic powders: 10-20wt%;

[0009] Antioxidants: 0-1wt%;

[0010] Coloring pigment: square-5wt%; and

[0011] Lubricating additives: 0.0-5wt%.

[0012] Wherein the inorganic filler is prepared to increase the rigidity of the composition, temperature resistance and dimensional stability, the inorganic filler include talc, mica, kaolin, etc., in the particle size of 300-500 mesh.

[0013] Wherein the nano-ceramic powders is the use of nanotechnology to develop a ceramic material having a particle size less than 1-100 nanometers. Nano-ceramic powder including nano ZrO2 ceramic powders, nano-TiO2 ceramic powders, nano-AL2O3 ceramic powders, nano 3Y-TZP ceramic powders, nano PTCR ceramic powder or silicon nano ceramic powder. Nano AL2O3 and ZrO2 at a lower temperature sintered ceramic with high strength, which Nano AL2O3 ceramic powder as matrix, with its dense fast, low sintering temperature ductility and a good interface to control the particle size in the sintering process in the preferred range of 20-50 nm, can be obtained with nano super good

According to claim 1 wherein the nylon composition according to claim 66, wherein: the antioxidant include antioxidants CA, antioxidant 1010, antioxidant 168, or.

According to claim 1, wherein the composition is nylon 66, characterized in that: said lubricating additives include calcium stearate or ethylene bis stearamide.

According to claim 1, wherein the composition of nylon 66, characterized in that: PA66 60wt%, talc 15wt%; Nano ZrO2 ceramic powder 20wt%, antioxidant CAO 5wt%, titanium dioxide 4wt% and stearin. acid I beggar 0.5wt%.

Nano-ceramic; 10-40wt%.; 6. Preparation of nylon 66 composition according to claim 1-5 for preparing one kind of claim, comprising the following steps: 1) Weigh Material:: PA66 50-80wt% inorganic filler Powder: 10-20wt%; Antioxidant: 0-1wt%; colored pigments: 0-5wt%; and lubricating additives: 0-0-5wt%; 2) mixed materials: materials will be added to the above weighed high-speed mixer, mix well; 3) extrusion granulation or hot forming.
superplastic ceramic material. Thus, nano-ceramic powder to prepare a composition of nylon 66 superplasticity substantial rigidity and raise 1¾.

Try the new Google Patents, with machine-classified Google Scholar results, and Japanese and South Korean patents. inorganic photocatalytic antibacterial material. For the photocatalytic inorganic antibacterial materials, photocatalytic semiconductor material TiO2, ZrO2, V2O3, ZnO, CdS, SeO2, GaP, SiC, etc., in ceramic glazes, adding TiO2 or ZnO nano materials and other ingredients, they are in the light will generate a lower conduction band electrons and valence band holes, hole-electron attractive effect, with oxidation ability, a strong reactivity, it can react with the surface adsorption of H2O or OH ions to form a strong oxidizing hydroxy, strong oxidizing means of hydroxyl to kill cells and penetrate cell membranes, destruction of membrane structure, the degradation of the toxin produced by the cells, while also absorbing the air of harmful substances, clean the air.

[0015] For the metal ion of metal oxide type inorganic antimicrobial materials, metal ions mainly of silver ions, silver ions and compounds having good antibacterial activity. Made with silver ion antimicrobial, glazed with water exposure can precipitate silver ions, the bacteria enter the body directly undermine the growth of bacteria; antibacterial mechanism of silver based inorganic antibacterial agent, there are two, one sustained release of silver ions sterilization antibacterial mechanism the second is the active oxygen sterilization mechanism. Sustained release antimicrobial silver ion sterilization mechanism refers to its use, slow release of antimicrobial agent Ag+, Ag+ because at very low concentrations can damage the bacterial cell membrane or strongly attracted to the bacterial enzyme protein body sparse group, and quickly together reducing the activity of the enzyme activity protoplast cells, it has an antibacterial effect. Therefore, by sustained release Ag+, inorganic antimicrobial agent may exert long-lasting antibacterial effect. Reactive oxygen antibacterial mechanism of silver ions indicates that reducing high oxidation state of silver is extremely high, in light of the role, under an antibacterial agent, and water or air, generating active ● 2 and X0H, with strong redox.

[0016] For the rare earth activated inorganic photocatalytic antibacterial material, is anti-bacterial nano-composite rare earth material added to the soil in the ceramic glaze recipe REE water may be oxidized to a strong oxidation activity of free radicals and negative ions, when When the bacterial cell membrane and play a role, aim to kill the bacteria.

[0017] Thus, nylon 66 composition consisting of nano-ceramic powder can greatly improve not only the rigidity, but also to prevent the surface of bacteria in the nylon 66 composition into breeding. Through experiments, by adding a small amount of nano-ceramic powder, not only can greatly reduce the amount of inorganic filler is added, but also significantly improve the rigidity of the nylon 66 composition.

[0018] The antioxidants used to improve the capacity of the thermal oxidative aging nylon 66 composition of antioxidants include antioxidants CA, antioxidant 1010, antioxidant 168, or the like.
[0019] The color pigment for the deployment of nylon 66 composition of color, such as white titanium dioxide available, the blue phthalocyanine blue, phthalocyanine green with green, etc., according to different needs and add corresponding coloring pigment, coloring pigment is general commercial products.

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stearate, ethylene bis stearamide and the like.

[0021] In addition, the present invention is necessary to provide a method for preparing a composition of nylon 66, comprising the following steps: 1) Weigh Material: PA66: 50-80wt%; inorganic filler: 10-40wt%; nano-ceramic powders: 10-20wt%; Antioxidant: O-lwt%; colored pigments: 〇_5wt%; and lubricating additives: 0-0·5wt%.

[0022] 2) the mixed material: The above material weighed was added to the high-speed mixer, mix well;

[0023] 3) extrusion granulation or hot forming: by extrusion granulation, the mixture was placed in a double screw extruder, cooled and diced produce a nylon 66 composition; by hot molding, the mixture is poured into a suitable mold, hot press molding.

[0024] In order to make nylon 66 compositions have better rigidity, the present invention by the addition of nano-ceramic powders obtained better rigidity effect. By choosing antioxidant, the material can be heat oxygen aging significantly improved; by adding a coloring pigment, enables products having the desired color and color. Nano-ceramic powder composition may also prevent the product surface bacteria, environmental health products. By the addition of lubricating additives to improve lubricity composition article and impact resistance. Nylon 66 composition prepared by the method of extrusion granulation or thermoformed, too. The resulting nylon 66 compositions can be used in automobiles, machinery, electronics, electrical and other industries.

DETAILED DESCRIPTION

[0025] Following examples and Comparative Examples further illustrate the present invention of nylon 66 composition and preparation methods, and be seen by comparing the addition of nano-ceramic powder obtained rigid improve significant effect. Specific examples further illustrate the present invention, the scope of non-limiting of the present invention.

[0026] Comparative Example I

[0027] PA66 60wt%, talc 35wt%; antioxidant CA0 · 5wt%, titanium dioxide and calcium stearate 4wt% 0·5 Wt% billion

[0028] Example I

[0029] PA66 60wt%, talc 25wt%; Nano - ZrO2 ceramic powders 10wt%, antioxidant CA0 5wt%, titanium white powder 4wt% and stearate I Hacks 0·5wt%.
Example 2
PA66 60wt%, talc 20wt%; Nano ZrO \cdot \n\text{porcelain powder 15wt\%}, antioxidants CA0.5wt\%, 4wt\% titanium dioxide and stearic I hack 0.5wt%.

Example 3
PA66 60wt%, talc 15wt%; Nano ZrO \cdot \n\text{porcelain powder 20wt\%}, antioxidants CA0.5wt\%, 4wt\% titanium dioxide and stearic I hack 0.5wt%.

Example 4
PA66 60wt%, talc 10wt%; Nano - ZrO2 ceramic powders 25wt\%, antioxidant CA0 5wt\%, titanium white powder 4wt\% and stearate I Hacks 0.5wt%.

Example 5
PA66 60wt%, talc 30wt%; Nano - ZrO2 ceramic powders 5 wt\%, antioxidant CA0 5wt\%, titanium white powder 4wt\% and stearate I Hacks 0.5wt%.

Comparative Example 2
PA66 50wt%, kaolin 45wt%; Antioxidant CA0 5wt\%, phthalocyanine green 4wt\% and stearate I Hacks billion 0.5wt%

Example 6
PA66 50wt%, kaolin 35wt%; Nano TiO2 Ceramic Powder 10wt\%, antioxidant CA0 5wt\%, phthalocyanine green 4wt\% and stearate I Hacks 0.5wt%.

Example 7
PA66 50wt%, kaolin 30wt%; Nano TiO2 Ceramic Powder 15wt\%, antioxidant CA0 5wt\%, phthalocyanine green 4wt\% and stearate I Hacks 0.5wt%.

Example 8
PA66 50wt%, kaolin 25wt%; Nano TiO2 Ceramic Powder 20wt\%, antioxidant CA0 5wt\%, phthalocyanine green 4wt\% and stearate I Hacks 0.5wt%.

Example 9
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[0047] PA66 50wt%, kaolin 20wt%: Nano TiO2 Ceramic Powder 25wt%, antioxidant CA0 5wt%, phthalocyanine green 4wt% and stearate I Hacks 0. 5wt%.

[0050] Comparative Example 3

[0051] PA66 80wt%, talc 15wt%: Antioxidant CA0 5wt%, 4wt% titanium dioxide and calcium stearate 0. 5 wt% billion

[0052] Comparative Example 4

[0053] PA66 80wt%, talc 20wt%.

[0054] Example 11

[0055] PA66 80wt%, talc 10wt%; nano-ceramic powder V2O3 10wt%, titanium dioxide and stearic ♦ beggar 4wt% 0 · 5wt%.

[0056] Example 12

[0057] PA66 80wt% ZrO2 nano ceramic powder 20wt%.

[0058] The above-described each component in each case uniformly mixed extrusion granulation or hot forming, that was the nylon 66 composition of products. In Example 1-11, the PA66, an inorganic filler, mixed for 5-10 minutes in a high speed mixer, followed by addition of an antioxidant, a coloring pigment, nano ceramic powder and a lubricating aid thoroughly mixed for 5-10 minutes, and then double- screw extruder with a screw speed 450r / min, extruder temperature between 175-2KTC. In Comparative Example 1-3, the inorganic filler is first mixed with PA66 5-10 minutes, followed by addition of an antioxidant and lubricating additives thoroughly mixed for 5-10 minutes, and then a twin-screw extruder.

[0059] The above Examples 1-12 and Comparative Examples 1-3 The components can also be mixed by the mixing into a mold, compressed to form obtained by heating a nylon 66 composition corresponding article. 1-12 as well as the composition ratio of 1-3 performance test results obtained in the above embodiments 1-3 the following table:

[0060] Table 1, Comparative Example 1 and Example 1-5 performance parameters

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Table 2. Comparative Example 2 Example 6-10 performance parameters

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Table 3, Comparative Example 3-4 and performance parameters 11-12

[0062] Table 2. Comparative Example 2 Example 6-10 performance parameters

[0063]

[0064] Table 3, Comparative Example 3-4 and performance parameters 11-12

[0065]
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[0066] As can be seen from the above embodiment, by Comparative Example 1 Comparative Example 1-3 or Comparative Example 2 Comparative Example 6-8, in the other components of the same proportion of cases, and by the addition of nano-ceramic powder, can reduce the amount of talc, can greatly improve the rigidity of nylon 66 compositions. Examples 1-3 Comparative Example 4-5, Comparative Example 6-8 or Example 9-10, when the nano-ceramic powder is less than 10% or more than 20%, of the high rigidity of the nylon 66 composition improved embodiment There are limitations. In summary, the nylon 66 composition of the present invention is obtained by adding nano-ceramic powders, tensile strength, Izod notched impact strength, and flexural strength have been significantly improved. Other components of the combination with PA66, also played a better coordinated effects. And by adding nano-ceramic powder, not only to improve the rigidity of the nylon 66 composition, but also to prevent the composition of the product surface bacteria, environmental health products. By adding a coloring pigment, the composition having a color and color article desired; by the addition of antioxidants, to improve thermal oxidative ability of nylon 66 composition aging.

[0067] said nylon 66 composition can be widely used in automobiles, machinery, electronics, electrical and other industries, such as the production of pipes, films, electrical accessories. Barrel made according to GB / T9647-2003 plastic pipe ring stiffness testing standards for testing, which greatly enhanced rigidity obtained. In particular, the use of nano-TiO2 ceramic powder and PA66 films prepared by the method GB15979-1995 bactericidal properties of the membrane material to be tested, tests show that the material sterilization wide range of fast, sterilization rate of Staphylococcus aureus Candida albicans, E. coli in 30min sterilization rate reached more than 90.00%; for hepatitis B virus killing rate in 20min to reach 43.43%.

[0068] above are only embodiments of the present invention is not patented and therefore limit the scope of the present invention, any use made of the present invention specification equivalent structures or equivalent process transformation, directly or indirectly related technologies used in other areas are included in the patent empathy scope of the invention.

PATENT CITATIONS

https://www.google.com/patents/CN102732018B?cl=en&dq=pigments+for+nylon+66&hl=en&sa=X&ved=0ahUKEwjS-5nfrcTOAhXISCYKHSaPAswQQ6AEIKjAC
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**CLASSIFICATIONS**

| International Classification | C08K3/22, C08K3/34, C08K13/02, C08L77/06 |

**LEGAL EVENTS**

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