

ANTIMICROBIAL AND PM 2.5 PARTICLE-FILTERING STEREOSCOPIC MASK FILTER SHEET

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TECHNICAL FIELD

[0001] The present invention belongs to the field of healthcare, and particularly relates to an antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet.

BACKGROUND OF THE INVENTION

10 [0002] Protective masks are a kind of respiratory health protective articles that are widely used in haze weather, pollen seasons and other occasions. The core component of the protective masks is an air filter sheet. The commercially available filter sheets are mainly used for filtering out fine particles such as PM 2.5 particles and pollens from the air. However, a large number of bacteria carried by the fine particles can be retained on the
15 mask filter sheet, and the bacteria retained on the filter sheet may multiply under the warm and humid micro-environment resulting from respiration, thereby forming secondary pollution, causing a hazard to respiratory health. Therefore, it is necessary for an effective protective mask filter sheet to not only have the function of highly-efficiently filtering fine particles such as PM 2.5 fine particles and pollens, but also possess the effect of rapid
20 sterilization to avoid secondary pollution. However, there is no such an effective protective mask filter sheet on the market.

SUMMARY OF THE INVENTION

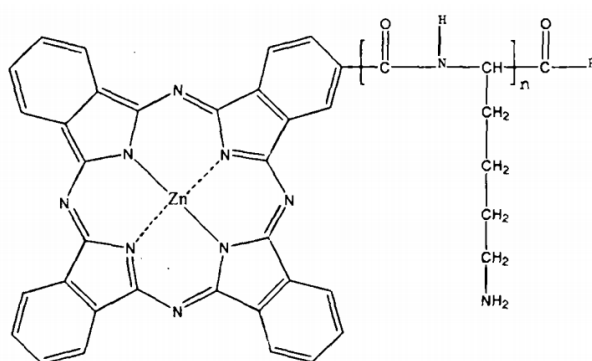
[0003] The present invention aims to use a light power antimicrobial technology to prepare
25 a highly-effective antimicrobial material, which is then composited with a filter material that efficiently filters PM 2.5 fine particles, to provide a stereoscopic mask filter sheet that is efficient in sterilization and efficiently filters a variety of particles such as PM 2.5 fine particles and pollens as well as microorganisms, so as to furnish effective protection for

healthy respiration against PM 2.5 particles, pollens and microorganisms. The filter sheet of the present invention can be used in combination with a stereoscopic mask, a medical mask or an ordinary mask to form a reusable antimicrobial and anti-haze mask, or can be directly prepared into a disposable antimicrobial and anti-haze mask.

5 [0004] The antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet of the present application is formed by compositing the following three layers: an antimicrobial outer layer (1), a filtering intermediate layer (2), and a protective barrier layer (3), in order to quickly kill pathogenic bacteria retained on the filter sheet while ensuring efficient filtration, so as to avoid multiplication of the pathogenic bacteria which may cause
10 secondary pollution, thereby playing a role of effective protection on respiratory health.

[0005] In the antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet of the present application, the antimicrobial outer layer comprises an antimicrobial agent which is amino acid zinc phthalocyanine or a derivative thereof, and one or more of wood fiber, cotton fiber, bamboo fiber, hemp fiber, carbon-containing fiber, PP, PVC artificial
15 fiber and blended fiber. Such a combination manner facilitates a wider range of uses of the light power antimicrobial technology.

[0006] In the antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet of the present application, the ingredient of the antimicrobial agent is amino acid zinc phthalocyanine or a derivative thereof, having the following chemical structural formula I:



Chemical structural formula (I)

wherein in the chemical structure I, R is a hydrophilic group, preferably hydroxy (-OH), carboxyl (-COOH), an ester group (-COOR₁), or the like; wherein the R₁ structure in

the ester group can be a hydrophilic group, hydrophobic group, or neutral group of a shorter chain length; and

wherein in the chemical structure I, the n value of the polymerization degree of the amino acid structural unit is 3-35, preferably 4-8 and 20-35.

5 [0007] The structure of the present invention is water soluble, and therefore is convenient to operate during the procedure of forming an antimicrobial layer, which facilitates industrial production.

[0008] In the antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet of the present application, the content of the antimicrobial agent, amino acid zinc
10 phthalocyanine, is 0.000001-0.0025%, which is low and therefore has little impact on human bodies and the environment.

[0009] In the antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet of the present application, an antimicrobial light power source is mainly a source of a LED red light, natural light, or laser, preferably a LED red light with a wavelength of 640-690 nm
15 and natural light. Such a combination can effectively utilize the light energy of the natural light to provide light power for the filter sheet, achieving a sterilizing rate of 99% in 30 min.

[0010] The antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet is characterized in that each of the left filter sheet (6) and right filter sheet (7) has upper and
20 lower rims that are linear or inward concave arc-shaped, has a completely symmetrical structure, and has a horizontal width of 60-110 mm; the vertical widths of the left filter sheet (6) and right filter sheet (7) at the side proximate to the welding strip (5) are 80-110 mm, and the vertical widths of the left filter sheet (6) and right filter sheet (7) at the side proximate to the adhesive strips (4) are 30-60 mm; and the welding strip (5) is located at a
25 position that is outward convex arc-shaped.

[0011] In the antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet of the present application, the angles between the upper rims of the left filter sheet (6) and

right filter sheet (7) and the horizontal line are 20-50 °, and the angles between the lower rims of the left filter sheet (6) and right filter sheet (7) and the horizontal line are 30-60 °.

[0012] In the antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet of the present application, the angle between an vertical tangent at the highest point on the convex of the welding strip (5) and the upper half arc of the welding strip is 10-40 °, and the angle between an vertical tangent at the most convex point on the convex of the welding strip (5) and the lower half arc of the welding strip is 10-40 °. The welding strip has a width of 1-3 mm, and a length corresponding to the radian of a front rim of the filter sheet.

[0013] In the antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet of the present application, the adhesive strips (4) are attached to the surface of the antimicrobial layer at a position which is 2-5 mm away from the edge, and have a width of 5-20 mm and a length of 20-50 mm.

[0014] In order to realize the purpose of the present invention, the present invention employs the following technical solutions:

[0015] 1. The filter sheet of the present invention effectively combines an antimicrobial layer, a filtering layer, and a protective layer by way of three-layer compositing, so as to effectively filter 0.3 micron fine particles with a filtering rate of 95-99%. Moreover, bacteria can be killed quickly to avoid secondary pollution generated during wearing.

[0016] 2. The filter sheet of the present invention utilizes a light power antimicrobial technology, which effectively uses the sunlight as the light power source for the photosensitizer, wherein the photosensitizer is irradiated by the natural light, absorbs energy from photons, undergoes a photochemical reaction, and thereby generates free-state or singlet-state oxygen to kill bacteria with a sterilizing rate of above 90% in 30 min.

[0017] 3. The filter sheet of the present invention utilizes an organic photosensitizer as the antimicrobial material, which has a good water-solubility, can be used in a low amount, and is friendly to human bodies and the environment.

[0018] 4. In the present invention, the antimicrobial and filtering functions are effectively combined with the stereoscopic structure of the filter sheet. This stereoscopic structure can

properly fit a human face, thereby avoiding air leakage while killing bacteria and filtering PM 2.5 particles. Such a stereoscopic structure can be made into a stereoscopic mask.

[0019] 5. The present invention employs an adhesive design, which can combine the filter sheet with different masks for wearing, so as to convert a common warmth-preserving mask
5 into a mask with antimicrobial and filtering functions.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] Fig. 1 is a constitutional diagram of an antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet.

10 [0021] Fig. 2 is a plane expanded diagram of an antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet with arc-shaped upper and lower rims.

[0022] Fig. 3 is a plane expanded diagram of an antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet with linear upper and lower rims.

[0023] Fig. 4 is a perspective structural diagram of an antimicrobial and PM 2.5
15 particle-filtering stereoscopic mask filter sheet.

[0024] Fig. 5 is a perspective structural diagram of a disposable antimicrobial and PM 2.5 particle-filtering stereoscopic mask.

[0025] Fig. 6 is a graph showing the data on rapid sterilization of an antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet.

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DETAILED DESCRIPTION OF THE INVENTION

Example 1

[0026] Fig. 1 is a constitutional diagram of an antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet. The filter sheet mainly comprises the following three layers:
25 an antimicrobial outer layer (1), an intermediate filtering layer (2), and an inner protective barrier layer (3), wherein the antimicrobial layer mainly comprises fiber melt-blown

non-woven fabrics with amino acid zinc phthalocyanine attached, the intermediate filtering layer is made of electret melt-blown non-woven fabrics, and the inner layer is made of polypropylene spunbond non-woven fabrics. The filter layers with such structures can effectively filter PM 2.5 particles with a filtering rate of above 95%, with an antimicrobial efficiency up to 99% in 30 min (see Fig. 6), and therefore can rapidly kill pathogenic bacteria (including drug-resistant bacteria, commonly known as super bacteria), including suppurative pathogenic bacteria, intestinal pathogenic bacteria and pathogenic fungi (see Table 1), thereby avoiding secondary pollution.

Example 2

[0027] Fig. 2 is a plane expanded diagram of an antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet with arc-shaped upper and lower rims. The filter sheet mainly comprises the following three layers: an antimicrobial outer layer (1), an intermediate filtering layer (2), and an inner protective barrier layer (3), wherein the antimicrobial layer is made of fiber melt-blown non-woven fabrics with amino acid zinc phthalocyanine attached, the intermediate filtering layer is made of electret melt-blown non-woven fabrics, and the inner layer is made of polypropylene spunbond non-woven fabrics. Each of the left filter sheet (6) and right filter sheet (7) has arc-shaped upper and lower rims (as shown in Fig. 2), has a completely symmetrical structure, and has a horizontal width of 60-110 mm. The vertical widths of the left filter sheet (6) and right filter sheet (7) at the side proximate to a welding strip (5) are 80-110 mm, and the vertical widths of the left filter sheet (6) and right filter sheet (7) at the side proximate to adhesive strips (4) are 30-60 mm. The welding strip (5) is located at a position that is outward convex arc-shaped. The angles between the upper rims of the left filter sheet (6) and right filter sheet (7) and the horizontal line are 20-50 °; and the angles between the lower rims of the left filter sheet (6) and right filter sheet (7) and the horizontal line are 30-60 °. The angle between an vertical tangent at the highest point on the convex of the welding strip (5) and the upper half arc of the welding strip is 10-40 °; and the angle between an vertical tangent at the most convex point on the convex of the welding strip (5) and the lower half arc of the welding strip is 10-40 °. The welding strip has a width of 1-3 mm, and a length corresponding to the radian of a front rim of the filter sheet. The filter layers with such structures can effectively filter PM 2.5

particles with a filtering rate of above 95%, with an antimicrobial efficiency up to 99% in 30 min (see Fig. 6), and therefore can rapidly kill bacteria, thereby avoiding secondary pollution. In the meantime, the stereoscopic structure can properly fit a human face (as show in Fig. 4) to avoid air leakage.

5 Example 3

[0028] Fig. 3 is a plane expanded diagram of an antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet with linear upper and lower rims. The filter sheet mainly comprises the following three layers: an antimicrobial outer layer (1), an intermediate filtering layer (2), and an inner protective barrier layer (3), wherein the antimicrobial layer
10 is made of fiber melt-blown non-woven fabrics with amino acid zinc phthalocyanine attached, the intermediate filtering layer is made of electret melt-blown non-woven fabrics, and the inner layer is made of polypropylene spunbond non-woven fabrics. Each of the left filter sheet (6) and right filter sheet (7) has linear upper and lower rims (as shown in Fig. 3), has a completely symmetrical structure, and has a horizontal width of 60-110 mm. The
15 vertical widths of the left filter sheet (6) and right filter sheet (7) at the side proximate to a welding strip (5) are 80-110 mm, and the vertical widths of the left filter sheet (6) and right filter sheet (7) at the side proximate to adhesive strips (4) are 30-60 mm. The welding strip (5) is located at a position that is outward convex arc-shaped. The angles between the upper rims of the left filter sheet (6) and right filter sheet (7) and the horizontal line are 20-50 °;
20 and the angles between the lower rims of the left filter sheet (6) and right filter sheet (7) and the horizontal line are 30-60 °. The angle between an vertical tangent at the highest point on the convex of the welding strip (5) and the upper half arc of the welding strip is 10-40 °, and the angle between an vertical tangent at the most convex point on the convex of the welding strip (5) and the lower half arc of the welding strip is 10-40 °. The welding strip has a width
25 of 1-3 mm, and a length corresponding to the radian of a front rim of the filter sheet. The filter layers with such structures can effectively filter PM 2.5 particles with a filtering rate of above 95%, with an antimicrobial efficiency up to 99% in 30 min (see Fig. 6), and therefore can rapidly kill bacteria, thereby avoiding secondary pollution. In the meantime, the stereoscopic structure can properly fit a human face (as show in Fig. 4) to avoid air
30 leakage.

Example 4

[0029] Fig. 4 is a plane diagram of an antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet with arc-shaped upper and lower rims. The filter sheet mainly comprises the following three layers: an antimicrobial outer layer (1), an intermediate filtering layer (2), and an inner protective barrier layer (3), wherein the antimicrobial layer is made of fiber melt-blown non-woven fabrics with amino acid zinc phthalocyanine attached, the intermediate filtering layer is made of electret melt-blown non-woven fabrics, and the inner layer is made of polypropylene spunbond non-woven fabrics. Each of the left filter sheet (6) and right filter sheet (7) has linear upper and lower rims (as shown in Fig. 3), has a completely symmetrical structure, and has a horizontal width of 60-110 mm. The vertical widths of the left filter sheet (6) and right filter sheet (7) at the side proximate to a welding strip (5) are 80-110 mm, and the vertical widths of the left filter sheet (6) and right filter sheet (7) at the side proximate to adhesive strips (4) are 30-60 mm. The welding strip (5) is located at a position that is outward convex arc-shaped. The angles between the upper rims of the left filter sheet (6) and right filter sheet (7) and the horizontal line are 20-50 °, and the angles between the lower rims of the left filter sheet (6) and right filter sheet (7) and the horizontal line are 30-60 °. The angle between an vertical tangent at the highest point on the convex of the welding strip (5) and the upper half arc of the welding strip is 10-40 °, and the angle between an vertical tangent at the most convex point on the convex of the welding strip (5) and the lower half arc of the welding strip is 10-40 °. The welding strip has a width of 1-3 mm, and a length corresponding to the radian of a front rim of the filter sheet. The filter layers with such structures can effectively filter PM 2.5 particles with a filtering rate of above 95%, with an antimicrobial efficiency up to 99% in 30 min (see Fig. 6), and therefore can rapidly kill bacteria, thereby avoiding secondary pollution. In the meantime, the stereoscopic structure can properly fit a human face (as show in Fig. 4) to avoid air leakage.

Example 5

[0030] Fig. 5 is a diagram of a disposable antimicrobial and PM 2.5 particle-filtering stereoscopic mask. The mask mainly comprises an antimicrobial outer layer (1), an

intermediate filtering layer (2), an inner protective barrier layer (3), a welding strip (5), a left filter sheet (6), a right filter sheet (7), ear belts (8), and a nose clip (9), wherein the major components of the mask are designed in a consistent way to the stereoscopic filter sheet, except that the ear belts (8) are added for convenient wearing, and the nose clip (9) is added to avoid air leakage of the disposable mask. The mask with such a structure can effectively filter PM 2.5 particles with a filtering rate of above 95%, with an antimicrobial efficiency up to 99% in 30 min (see Fig. 6), and therefore can rapidly kill bacteria, thereby avoiding secondary pollution. In the meantime, the stereoscopic structure can properly fit a human face (as show in Fig. 4) to avoid air leakage and is simple and convenient for use.

Table 1: Data on sterilization by the antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet

Category Item	Strain	Reference standard	Testing organization	Time used (h)	Antimicrobial efficiency (%)	Notes
1	<i>E. coli</i>	GB_15979-2002 Hygienic standard for (indissoluble) disposable sanitary products	Technical Institute of Physics and Chemistry, CAS	1	> 99	Irradiated by natural light
2	<i>Staphylococcus aureus</i>	GB_15979-2002 Hygienic standard for (indissoluble) disposable sanitary products	Technical Institute of Physics and Chemistry, CAS	1	> 99	
3	<i>Candida albicans</i>	GB_15979-2002 Hygienic standard for (indissoluble) disposable sanitary products	Institute of Research on the Structure of Matter, CAS	1	> 99	
4	Methicillin-resistant <i>Staphylococcus aureus</i>	AATCC 100-2012 Antibacterial Finishes on Textile Materials	Switzerland Universal Standard Technical Service Co., Ltd. (abbreviated as SGS)	24	99.6 by 24 h	

Industrial applicability

[0031] The antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet of the present invention utilizes an antimicrobial technology that is a pioneering method, wherein the antimicrobial layer combines an antimicrobial agent and non-woven fabrics in an effective manner. This antimicrobial manner can achieve efficient and rapid sterilization, with a sterilizing rate of above 99% in 30 min, which means that the sterilization time can be greatly decreased as compared to traditional materials, thereby avoiding generation of secondary pollution. Moreover, the antimicrobial material used is safe and environment-friendly. The present invention is of great significance in the industrialized society where environment deteriorates and PM 2.5 index rises.

[0032] The combination of the antimicrobial and filtering technologies utilized for the antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet of the present invention is a simple fusion process. Although the process for developing the antimicrobial technology to improve the performance of the antimicrobial material is relatively complex, it is the task undertaken by experts. The antimicrobial and PM 2.5 particle-filtering stereoscopic filter sheet of the present invention involves basic principles or conclusions such as photodynamic principle and electrostatic adsorption. An invention that builds on clear theoretical foundations is the most reliable and clearest invention with the most promising application prospect. This is the scientific basis of the present invention, and it is also the premise of suitability for industrial application.

[0033] Major advantages of industrial applicability are derived from structural innovations, which are of great significance. Use of masks in China can be traced back to dust-proof silk woven towel which were worn in the court in the early thirteenth century. In 1897, Germans introduced a kind of gauze that can prevent bacterial invasion. The present invention uses a fast antimicrobial method and an efficient filtering method in combination for a special stereoscopic structure, demonstrating wide suitability of this stereoscopic filter sheet for combination with other masks. Its advantages of efficient and environment-friendly industrial applicability will bring about revolutionary changes in the existing air-purifying

and environmental protection field. The technical advantages of the product have been emerged preliminarily.

[0034] Industrial applicability lies in the application prospect and extensiveness of the suitable population. With global economic developments, industrial pollution, spread of
5 germs and bacteria, and PM 2.5 particle pollution are getting worse, putting human health in danger. Particles such as common pollens, particles from crop burning, etc., and droplets spread in public places such as hospitals also have adverse effects on human health. In various harmful environments, people have to take corresponding protective steps during traveling, which is also the original intention of the mask filter sheet of the present
10 invention. The mask filter sheet of the present invention provides effective protections for people during traveling, mainly comprising antimicrobial and filtering functions, and also involving comfortableness and applicability during wearing. Meanwhile, the mask filter sheet has a low resistance, can be easily combined with other masks, has a great universality, can be readily implemented during manufacturing of products, and is simple
15 for use; therefore, it possesses huge market prospects and social benefits.

CLAIMS

WHAT IS CLAIMED IS:

1. An antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet formed by compositing the following three layers: an antimicrobial outer layer (1), a filtering
5 intermediate layer (2), and a protective barrier layer (3), wherein the antimicrobial and PM 2.5 particle-filtering filter sheet comprises a left filter sheet (6) and a right filter sheet (7) combined or sutured by a welding strip (5) set therebetween, and is combined with a mask by adhesive strips (4), wherein the antimicrobial outer layer (1), the filtering intermediate layer (2), the protective barrier layer (3), the adhesive strips (4), the welding strip for
10 combining or suturing (5), the left filter sheet (6), and the right filter sheet (7) constitute the antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet;

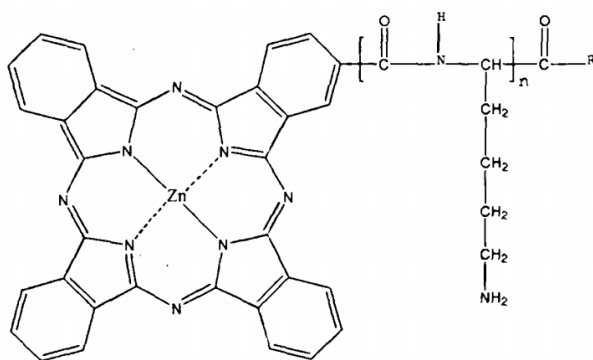
wherein the antimicrobial outer layer (1), the filtering intermediate layer (2), the protective barrier layer (3), the welding strip for combining or suturing (5), the left filter sheet (6), the right filter sheet (7), ear belts (8), and a nose clip (9) constitute a disposable
15 stereoscopic mask;

wherein the antimicrobial outer layer (1) comprises an antimicrobial agent which is amino acid zinc phthalocyanine or a derivative thereof, and one or more of wood fiber, cotton fiber, bamboo fiber, hemp fiber, carbon-containing fiber, PP, PVC artificial fiber and blended fiber, and a light power source is provided by natural light or LED red light;

20 wherein the filtering intermediate layer (2) is electret melt-blown non-woven fabrics;
and

wherein the protective barrier layer (3) is polypropylene spunbond non-woven fabrics.

2. The antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet according to claim 1, wherein the ingredient of the antimicrobial agent is amino acid zinc
25 phthalocyanine or a derivative thereof, having the following chemical structural formula I,



Chemical structural formula (I)

wherein in the chemical structure I, R is a hydrophilic group, preferably hydroxy (-OH), carboxyl (-COOH), an ester group (-COOR₁), or the like; wherein the R₁ structure in
 5 the ester group can be a hydrophilic group, hydrophobic group, or neutral group of a shorter chain length; and

wherein in the chemical structure I, the n value of the polymerization degree of the amino acid structural unit is 3-35, preferably 4-8 and 20-35.

3. The antimicrobial and PM 2.5 particle-filtering stereoscopic filter sheet according to
 10 claim 1, wherein the antimicrobial light power source is mainly a source of a LED red light, natural light, or laser, preferably a LED red light with a wavelength of 640-690 nm and natural light.

4. The antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet according to claim 1 or 2, wherein the content of the antimicrobial agent, amino acid zinc
 15 phthalocyanine, is 0.000001-0.0025%.

5. The antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet according to claim 1, wherein the antimicrobial agent is combined with one or more of wood fiber, cotton fiber, bamboo fiber, hemp fiber, carbon-containing fiber, PP, PVC artificial fiber and blended fiber by one or more of dip-dyeing, printing and dyeing, and
 20 spraying; and

wherein the treated fiber melt-blown non-woven fabrics is dried at a temperature of 30-180 °C, preferably 40-120 °C.

6. The antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet according to claim 1, wherein each of the left filter sheet (6) and right filter sheet (7) has upper and lower rims that are linear or inward concave arc-shaped, has a completely symmetrical structure, and has a horizontal width of 60-110 mm; the vertical widths of the left filter sheet (6) and right filter sheet (7) at the side proximate to the welding strip (5) are 80-110 mm, and the vertical widths of the left filter sheet (6) and right filter sheet (7) at the side proximate to the adhesive strips (4) are 30-60 mm; and the welding strip (5) is located at a position that is outward convex arc-shaped.

7. The antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet according to claim 1, wherein the angles between the upper rims of the left filter sheet (6) and right filter sheet (7) and the horizontal line are 20-50 °; and the angles between the lower rims of the left filter sheet (6) and right filter sheet (7) and the horizontal line are 30-60 °.

8. The antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet according to claim 1, wherein the angle between an vertical tangent at the highest point on the convex of the welding strip (5) and the upper half arc of the welding strip is 10-40 °; the angle between an vertical tangent at the most convex point on the convex of the welding strip (5) and the lower half arc of the welding strip is 10-40 °; the welding strip has a width of 1-3 mm, and the welding strip/suturing has a length corresponding to the radian of a front rim of the filter sheet.

9. The antimicrobial and PM 2.5 particle-filtering stereoscopic mask filter sheet according to claim 1, wherein the adhesive strips (4) are fixed to the antimicrobial outer layer at a position 2-5 mm away from the edge, and have a width of 5-20 mm and a length of 20-50 mm.