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(54) **WATERPROOF RECYCLED PAPER AND PRODUCTION METHOD THEREOF**

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ABSTRACT

Waterproof recycled paper and production method thereof are provided by the present invention. The waterproof recycled paper utilizes waste paper and plant fiber as raw material for papermaking. The waterproof recycled paper is produced by adding waterproof additive for size mixing after beating the paper pulp in a papermaking section, wherein the waterproof additive comprises oil, resin, starch, pectin, soda pulp, sulfite pulp, sulfate pulp, polyacrylonitrile, marble powder, water-soluble high polymer and sodium hydroxide, and combining with conventional process for papermaking. Without changing paper texture, the waterproof recycled paper of the present invention has waterproof property both on an outer and an inner surface thereof. The surfaces of the paper can be written or printed. The waterproof paper of the present invention has characteristics of white color, non-toxic and no smell. The paper can be dyed to any color without damaging the waterproof property thereof. The waterproof paper of the present invention can be utilized as wrapping paper, writing paper, paper for manufacturing protective clothing or paper bag, and can be recycled and thus is an environmental friendly paper.

WATERPROOF RECYCLED PAPER AND PRODUCTION METHOD THEREOF

CROSS REFERENCE OF RELATED APPLICATION

[0001] This is a U.S. National Stage under 35 U.S.C. 371 of the International Application PCT/CN2014/072873, filed Mar. 4, 2014, which claims priority under 35 U.S.C. 119(a-d) to CN 201310297214.5, filed Jul. 16, 2013.

BACKGROUND OF THE PRESENT INVENTION

[0002] Field of Invention

[0003] The present invention relates to a paper and a production method thereof, and more particularly to a waterproof recycled paper and production method thereof, which belongs to a field of paper and producing technique thereof.

[0004] Description of Related Arts

[0005] With the development of technology, the improvement of society and people's living standard, paper is widely applied in various fields and plays a variety of roles. In industries such as navigation, construction and catering, paper materials with waterproof properties are required, such as nautical chart paper, waterproof packing paper, paperboard for fast food container, paper for cups, paper for slipper, waterproof and thermal insulation paper or paperboard.

[0006] Waterproof property of the conventional paper is obtained by adding waterproof chemicals in paper pulp, e.g., the base paper is impregnated in wax, heavy oil is added in the paper pulp, water-proofing agent is coated on a surface of the paper manufactures. A Chinese patent with an application number of CN1237227C discloses a waterproof breathable paper made of fiber stuff and heavy oil, wherein the fiber stuff comprises wood fiber stuff, hemp fiber stuff, mulberry fiber stuff, nutshell fiber stuff, natural bamboo fiber stuff and natural reed fiber stuff. The waterproof breathable paper is manufactured by steps of producing a base paper by the fiber stuff, drying, and coating a layer of heavy oil on a surface of the base paper in a heavy oil bath. This type of paper has characteristics of water resistance, ventilation and great drawing force. However, since during the production process of this type of paper, heavy oil is utilized, the process of heating the material of heavy oil is needed. Furthermore, the processes of heating the insulated storage tank of heavy oil, the coating bath and the drying room are all required. Thus, operation processes are quite complicated, which increases costs of production. Some kinds of waterproof paper produced by the conventional arts have poor waterproof performances, if the paper is frequently utilized or has frequent frictions on a surface thereof, the waterproof layer on a surface of the paper is destroyed, which even leads to the loss of waterproofing property. Due to lack of air permeability, toughness and strength, some kinds of the waterproof paper is easily damaged and has a short service life. Some conventional waterproof paper has waterproofing chemicals on a surface thereof, so writing and printing functions of the surface of the paper is affected. In order to get high waterproof performance, some kinds of the waterproof paper have excessive chemicals added therein, so that environmental performance of the paper is decreased.

[0007] Recycled paper is made from waste paper, wherein the waste paper is manufactured by a plurality of processes

including breaking into pieces, decolorizing and pulping. The recycled paper is used for producing notebook, wrapping paper, packing box, business card, shell for wrapping pencil core to produce environmental protection pencil, cigarette filter made of combination of recycled paper and acetate fiber. Due to advantages of energy conservation, environmental protection and low cost, the recycled paper is widely applied in social life. However, at present, waterproof recycled paper with specific waterproof properties is rarely disclosed.

SUMMARY OF THE PRESENT INVENTION

[0008] In view of shortcomings of the conventional arts, the present invention provides a waterproof recycled paper and a production method thereof. By utilizing a raw material of mixed pulp of waste paper pulp and plant fiber pulp, the waterproof recycled paper of the present invention is produced by adding waterproof additive to the paper pulp in a papermaking section of a production process of the conventional paper, in such a manner that the paper has a waterproof function.

[0009] A technical solution adopted by the present invention is as follows.

[0010] A waterproof recycled paper, which is produced by a method comprising steps of:

[0011] producing waste paper pulp utilizing a raw material of waste paper by pulping process for producing conventional paper,

[0012] producing plant fiber pulp by steaming a raw material of plant fiber for papermaking,

[0013] mixing the waste paper pulp and the plant fiber pulp to obtain a raw material of paper pulp,

[0014] processing the paper pulp with washing, screening, bleaching, hydrating and grinding,

[0015] adding waterproof additive for size mixing after beating the paper pulp in a papermaking section, so as to obtain paper stock, and

[0016] conveying the paper stock obtained to a paper machine for manufacturing paper with the paper stock.

[0017] The waterproof additive comprises oil, starch, water-soluble high polymer and sodium hydroxide.

[0018] The step adding waterproof additive for size mixing after beating the paper pulp in a papermaking section specifically comprises: during the papermaking section, after the process of beating the paper pulp is finished, adding additive accounting for mass fractions of the paper pulp as follows: oil 1%~2%, resin 2%~2.5%, starch 1%~2%, pectin 1.5%~2%, soda pulp 1.5%~2%, sulfite pulp 1.5%~2%, sulfate pulp 1%~2%, polyacrylonitrile 1%~2%, marble powder 1%~2%, water-soluble high polymer 1%~2%, and sodium hydroxide 2.5%~3.5%.

[0019] The oil is plant oil which is natural oil, such as soybean oil.

[0020] The resin is natural resin.

[0021] The water-soluble high polymer is natural water-soluble high polymer comprising starch, cellulose and vegetable gelatin which are extracted from natural plant or animal, or at least one natural water-soluble high polymer which is processed with chemical modification.

[0022] A weight ratio of the waste paper pulp and the plant fiber pulp is: waste paper pulp: plant fiber pulp=35~45% :55~65%.

[0023] The during the step producing plant fiber pulp by steaming the raw material of plant fiber for papermaking, a weight ratio of an over dry tablet to well water, river water or tap water is 1:3.

[0024] The hydrating and grinding comprises a step of sending the mixed paper pulp which is processed with washing, bleaching and screening to a grinding system to grind for 30-240 min, so as to obtain beat pulp having a beating degree of 45° and SR-48°.

[0025] A concentration of paper pulp for loading to sieves of the papermaking machine is 0.1-1.2%.

[0026] The waterproof recycled paper is applied in manufacturing and processing packaging material, printing material, decorative material and protective material.

[0027] The waterproof recycled paper, which is utilized and processed with recycling and purifying, is applied in the process for producing the waterproof recycled paper for serving as a fibrous material.

[0028] Compared with the prior arts, beneficial effects of the present invention are as follows.

[0029] (1) Currently, there is no recycled paper specifically forming waterproof recycled paper. An innovation point of the present invention lies in forming waterproof recycled paper by reforming the structure to form waterproof recycled paper, which is not disclosed yet.

[0030] (2) The conventional waterproof paper generally gets a waterproof property by coating a waterproof layer on a surface thereof. However, the process causes that a surface of paper produced thereby loses aesthetic perception or writing property. Waterproof property of the waterproof recycled paper of the present invention is not obtained by coating a waterproof layer on a surface thereof, but by adding waterproof additive to the paper pulp during a production process, thus, appearances and writing property of the paper is not damaged.

[0031] (3) The conventional waterproof paper generally gets a waterproof property by coating a waterproof layer on a surface thereof, so when the paper is folded or rubbed for a plurality of times, the water proof layer on the surface is destroyed and the waterproof property is lost. A whole of the waterproof recycled paper of the present invention is waterproof material and thus has a longer service life.

[0032] (4) The waterproof recycled paper of the present invention is renewable and is environmentally friendly. During a production process of the waterproof recycled paper, a main raw material adopts plant fiber, accessories and waterproof additives adopt natural material such as resin, pectin and marble powder to replace chemicals such as waterproof glue, waterproof plastic mold, PU, PVC and heavy oil which are adopted by the conventional waterproof paper. With the raw materials combining with the conventional process of papermaking, the paper can obtain better waterproof property.

[0033] (5) The surface coating of general waterproof paper is plastic mold or other non-decomposable substances, and thus can not be writing or even recycled. However, the waterproof recycled paper of the present invention can be renewed by the production process to produce waterproof recycled paper after being fully grinded.

[0034] (6) The waterproof recycled paper of the present invention has waterproof property both on an outer and an inner surface thereof. The surfaces of the paper can be written or printed. The waterproof paper of the present invention has characteristics of white color, non-toxic and

no smell. The paper can be dyed to any color without damaging the waterproof property thereof. The waterproof paper of the present invention can be utilized as wrapping paper, writing paper, paper for manufacturing protective clothing or paper bag, and can be recycled and thus is an environmental friendly paper. The waterproof recycled paper of the present invention adopts waste paper for serving as a main raw material, which achieves recycling the resources and has cost advantages.

[0035] These and other objectives, features, and advantages of the present invention will become apparent from the following detailed description, the accompanying drawings, and the appended claims.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0036] Combined with the preferred embodiments, further description of the present invention is illustrated as follows, but the preferred embodiments are not intended to be limiting.

Embodiment 1

[0037] The waterproof recycled paper of the present invention is produced by the following method comprising steps of:

[0038] 1. producing sulfate eucalyptus pulp according to a conventional pulping method, wherein an eucalyptus chip and tap water are mixed according to a weight ratio of 1:3 and processed with kraft pulping; recycling mixed office waste, sorting and re-pulping by a hydrapulper to obtain a waste paper pulp; and uniformly mixing the waste paper pulp and the sulfate eucalyptus pulp according to a weight ratio of 35%: 65%, so as to produce a mixed paper pulp;

[0039] 2. processing the mixed paper pulp with washing, bleaching and screening, then sending to a grinding system to grind for 30 min, so as to obtain beat pulp having a beating degree of 45° and SR, concentrating for utilizing;

[0040] 3. during papermaking process, dispersing, purifying the wood chip, refining and beating, after the process of beating the paper pulp is finished, processing size mixing by adding additive accounting for mass fractions of the paper pulp as follows: soybean oil 1%, resin 2.2%, starch 1%, pectin 2%, soda pulp 2%, sulfite pulp 2%, sulfate pulp 2%, polyacrylonitrile 1%, marble powder 1%, water-soluble high polymer 1%, and sodium hydroxide 2.5%;

[0041] 4. after the size mixing is finished, sending to paper machine for paper making via a paper stock transferring system, wherein a concentration of paper pulp for loading to sieves of the papermaking machine is 0.1%, and processing with squeezing, drying, surface treating and press polishing, in such a manner that paper sheet is formed.

Embodiment 2

[0042] The waterproof recycled paper of the present invention is produced by the following method comprising steps of:

[0043] 1. producing sulfate wheat straw pulp according to a conventional pulping method, wherein an tablet and river water are mixed according to a weight ratio of 1:3 and processed with sulfite pulping; recycling mixed office waste, sorting and re-pulping by a hydrapulper to obtain a waste paper pulp; and uniformly mixing the waste paper pulp and

the sulfate wheat straw pulp according to a weight ratio of 40% : 60%, so as to produce a mixed paper pulp;

[0044] 2. processing the mixed paper pulp with washing, bleaching and screening, then sending to a grinding system to grind for 120 min, so as to obtain beat pulp having a beating degree of 46° and SR, concentrating for utilizing;

[0045] 3. during papermaking process, dispersing, purifying the wood chip, refining and beating, after the process of beating the paper pulp is finished, processing size mixing by adding additive accounting for mass fractions of the paper pulp as follows: soybean oil 2%, resin 2.5%, starch 1.5%, pectin 1.8%, soda pulp 1.5%, sulfite pulp 1.8%, sulfate pulp 2%, polyacrylonitrile 1.8%, marble powder 1.5%, water-soluble high polymer 2%, and sodium hydroxide 3.5%;

[0046] 4. after the size mixing is finished, sending to paper machine for paper making via a paper stock transferring system, wherein a concentration of paper pulp for loading to sieves of the papermaking machine is 1.2%, and processing with squeezing, drying, surface treating and press polishing, in such a manner that paper sheet is formed.

Embodiment 3

[0047] The waterproof recycled paper of the present invention is produced by the following method comprising steps of:

[0048] 1. producing bagasse pulp according to a conventional pulping method, wherein a tablet and tap water are mixed according to a weight ratio of 1:3 and processed with streaming; recycling mixed office waste, sorting and repulping by a hydrapulper to obtain a waste paper pulp; and uniformly mixing the waste paper pulp and the bagasse pulp according to a weight ratio of 45% : 55%, so as to produce a mixed paper pulp;

[0049] 2. processing the mixed paper pulp with washing, bleaching and screening, then sending to a grinding system to grind for 240 min, so as to obtain beat pulp having a beating degree of 48° and SR, concentrating for utilizing;

[0050] 3. during papermaking process, dispersing, purifying the wood chip, refining and beating, after the process of beating the paper pulp is finished, processing size mixing by adding additive accounting for mass fractions of the paper pulp as follows: peanut oil 1.5%, resin 2%, starch 1%, pectin 1.5%, soda pulp 1.6%, sulfite pulp 1.5%, sulfate pulp 1.5%, polyacrylonitrile 1%, marble powder 1-2%, water-soluble high polymer 1.5%, and sodium hydroxide 3%;

[0051] 4. after the size mixing is finished, sending to paper machine for paper making via a paper stock transferring system, wherein a concentration of paper pulp for loading to sieves of the papermaking machine is 0.8%, and processing with squeezing, drying, surface treating and press polishing, in such a manner that paper sheet is formed.

[0052] One skilled in the art will understand that the embodiment of the present invention as shown in the drawings and described above is exemplary only and not intended to be limiting.

[0053] It will thus be seen that the objects of the present invention have been fully and effectively accomplished. Its embodiments have been shown and described for the purposes of illustrating the functional and structural principles of the present invention and is subject to change without departure from such principles. Therefore, this invention includes all modifications encompassed within the spirit and scope of the following claims.

1-10. (canceled)

11. A waterproof recycled paper, which is produced by a method comprising steps of:

producing waste paper pulp utilizing a raw material of waste paper by pulping process for producing conventional paper,

producing plant fiber pulp by steaming a raw material of plant fiber for papermaking,

mixing the waste paper pulp and the plant fiber pulp to obtain a raw material of paper pulp,

processing the paper pulp with washing, screening, bleaching, hydrating and grinding,

adding waterproof additive for size mixing after beating the paper pulp in a papermaking section, so as to obtain paper stock, and

conveying the paper stock obtained to a paper machine for manufacturing paper with the paper stock.

12. The waterproof recycled paper, as recited in claim 11, wherein the waterproof additive comprises oil, starch, water-soluble high polymer and sodium hydroxide.

13. The waterproof recycled paper, as recited in claim 11, wherein the step adding waterproof additive for size mixing after beating the paper pulp in a papermaking section specifically comprises: during the papermaking section, after the process of beating the paper pulp is finished, adding additive accounting for mass fractions of the paper pulp as follows: oil 1%~2%, resin 2%~2.5%, starch 1%~2%, pectin 1.5%~2%, soda pulp 1.5%~2%, sulfite pulp 1.5%~2%, sulfate pulp 1%~2%, polyacrylonitrile 1%~2%, marble powder 1%~2%, water-soluble high polymer 1%~2%, and sodium hydroxide 2.5%~3.5%.

14. The waterproof recycled paper, as recited in claim 12, wherein the oil is plant oil which is natural oil, the resin is natural resin, the water-soluble high polymer is natural water-soluble high polymer comprising starch, cellulose and vegetable gelatin which are extracted from natural plant or animal, or at least one natural water-soluble high polymer which is processed with chemical modification.

15. The waterproof recycled paper, as recited in claim 13, wherein the oil is plant oil which is natural oil, the resin is natural resin, the water-soluble high polymer is natural water-soluble high polymer comprising starch, cellulose and vegetable gelatin which are extracted from natural plant or animal, or at least one natural water-soluble high polymer which is processed with chemical modification.

16. The waterproof recycled paper, as recited in claim 11, wherein a weight ratio of the waste paper pulp and the plant fiber pulp is: waste paper pulp:

plant fiber pulp=35~45%: 55-65%.

17. The waterproof recycled paper, as recited in claim 11, wherein the during the step producing plant fiber pulp by steaming the raw material of plant fiber for papermaking, a weight ratio of an over dry tablet to well water, river water or tap water is 1:3.

18. The waterproof recycled paper, as recited in claim 11, wherein the hydrating and grinding comprises a step of sending the mixed paper pulp which is processed with washing, bleaching and screening to a grinding system to grind for 30-240 min, so as to obtain beat pulp having a beating degree of 45° and SR-48°.

19. The waterproof recycled paper, as recited in claim 11, wherein a concentration of paper pulp for loading to sieves of the papermaking machine is 0.1-1.2%.

20. A method for manufacturing packaging material, printing material, decorative material and protective material which have waterproof property comprising applying the waterproof recycled paper as recited in claim **11** as a base material.

21. A method for producing waterproof recycled paper comprising applying waterproof recycled paper as recited in claim **11** which is utilized and processed with recycling and purifying for serving as a fibrous material.

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