In accordance with a first aspect of the embodiment, a flexible abrasive product surface is provided. The flexible abrasive product surface includes repeating units of abrasive zones surrounded by channel portions. Repeating unit boundaries opposite to each other have congruent curvature to form a complementary pair to fit the repeating units together in a pre-emptying manner and the channel portions include first channel portions with a substantially constant first channel width and second channel portions with a substantially constant second channel width along the channel portion length.

In accordance with a second aspect of the embodiment, a method to obtain an abrasive product is provided. The method includes providing a backing layer, and forming repeating units of abrasive zones surrounded by channel portions on the backing layer. The repeating unit boundaries opposite to each other have congruent curvature to form a complementary pair to fit the repeating units together in a pre-emptying manner and the channel portions include first channel portions with a substantially constant first channel width and second channel portions with a substantially constant second channel width along the channel portions length.

Objects and embodiments of the invention are further described in the independent and dependent claims of the application.

Description of the Drawings

The drawings are schematic and may be out of perspective.
The drawings are intended for illustrative purposes.
In the drawings and in the description, the symbols S_x, S_y and S_z represent orthogonal coordinate directions perpendicular to each other.

Figure 1 represents a reduced example of an abrasive product structure.

Figure 2 represents a reduced example of an abrasive product structure attachable to an abrasive apparatus.

Figure 3 represents a reduced example of a backing layer comprising different functional layers.

Figures 4a and 4b represent reduced examples of an abrasive layer structure

Figure 5 represents a reduced example of a backing layer structure comprising recessed areas.

Figure 6 represents a reduced example of a functional layer structure comprising recessed areas

Figure 7 represents a reduced example of an abrasive layer adjoined to a backing layer comprising recessed areas.

Figure 8 represents a reduced example of a cross-section C-C of an abrasive product.

Figure 9 represents a reduced example of an abrasive product from above.

Figure 10 represents a reduced example of an abrasive product surface comprising abrasive zones and channel portions.

Figure 11 represents a reduced example of channel portions comprising curvature.

Claims:

1. A flexible abrasive product (100) comprising a surface (110) with multiple abrasive zones (118) supported by a backing layer (101), each abrasive zone (118) surrounded by interconnected channel portions (221, 222) having substantially constant transverse dimensions (td1, td2) along the channel portion lengths, wherein the transverse dimension (td1, td2) is width (w1, w2) by height (h1, h2), the channel portions (221, 222) comprising different widths (w1, w2) such that the channel portions (221, 222) comprise first channel portions (221) with a substantially constant first channel width (w1) and second channel portions (222) with a substantially constant second channel width (w2).

2. The abrasive product (100) according to claim 1, comprising more than two channel portion (201, 202) levels increasing in transverse dimension.

3. The abrasive (100) product according to claim 1 or 2, wherein the transverse dimension (td1, td2) is substantially constant throughout the channel portion (201, 202).

4. The abrasive product (100) according to any of the claims 1 to 3, wherein the channel portion length refers to the shortest surface distance between two branching points or intersections of a channel between two abrasive zones.

5. The abrasive product (100) according to any of the claims 1 to 4, wherein the backing layer (101) is extruded, die cast or injection moulded and comprises first channel portions (221) with a first transverse dimension (td1) arranged to improve the abrasive product (100) flexibility.

6. The abrasive product (100) according to any of the claims 1 to 5, wherein second channel portions (222) comprise curvature to avoid linear interference.

7. The abrasive product (100) according to any of the claims 1 to 6, wherein the second channel portions (222) comprise a maximum linear length (L5) of

less than 2.5 times an oscillation amplitude of an abrasive apparatus (300) compatible with said abrasive product (100), for less than 2.5 times 2.5 mm, or less than 2.5 times 5 mm, or less than 2.5 times 8 mm.

8. The abrasive product (100) according to any of the claims 1 to 7, wherein the second channel portions (222) define a network (NT1) of interconnected channel portions (221, 222).

9. The abrasive product (100) according to claim 8, wherein the network (NT1) of interconnected channel portions (221, 222) defines a repeating pattern RP1, RP2, RP3, RP4, RP5, RP6, RP7, RP8, RP9, RP10, RP11, RP12, RP13, RP14.

10. A flexible abrasive product surface (110) comprising repeating units (RU1, RU2, RU3, RU4, RU5, RU6, RU7) of abrasive zones (118) surrounded by channel portions (221, 222), wherein repeating unit (RU1, RU2, RU3, RU4, RU5, RU6, RU7) boundaries opposite to each other have congruent curvature to form a complementary pair to fit the repeating units (RU1, RU2, RU3, RU4, RU5, RU6, RU7) together in a pre-emptying manner and the channel portions (221, 222) comprise first channel portions (221) with a substantially constant first channel width (w1) and second channel portions (222) with a substantially constant second channel width (w2) along the channel portion length.

11. The abrasive product surface (110) according to claim 10, wherein multiple repeating units (RU1, RU2, RU3, RU4, RU5, RU6, RU7) are arranged in a pre-emptying manner for filling the whole surface (110) of the abrasive product (100).

12. The abrasive product surface (110) according to claim 10 or 11, wherein the repeating units (RU1, RU2, RU3, RU4, RU5, RU6, RU7) comprise self-similar or a congruent shapes.

13. The abrasive product (100) according to claim 1, wherein the area of an abrasive zone (118) is in the range of 0.5 to 75 mm^2, and wherein the total area of the channel portions is in the range of 20 to 50 % of the total area of the abrasive product (100).

14. The abrasive product (100) according to claim 1 or 10, wherein the abrasive zones (118) have congruent shapes.

15. The abrasive product (100) according to claim 10, wherein an abrasive layer (111) adjoined to the backing layer (101) comprises the first channel portions (221), the second channel portions (222) and multiple abrasive zones (118).

16. The abrasive product (100) according to claim 1 or 10, wherein recessed areas (201, 202, 203) matching the second channel portions (222) are provided on the backing layer (101).

17. The abrasive product according to claim 16, wherein the position of the recessed areas (201, 202, 203) on the backing layer (101) substantially coincides with the position of the second channel portions (222) on the abrasive layer (111) to increase the volume of the second channel portions (202).

18. The abrasive product (100) according to claim 1 or 10, comprising openings (226) extending through the backing layer (101) and an abrasive layer (111) with a maximum opening width (w3) equal to the second channel width (w2) and a maximum opening length (L3) equal to the maximum length (L5) of the second channel portions (222).

19. The abrasive product (100) according to claim 1, wherein the second channel portions (222) are arranged to suspend water, convey a mixture of water and abraded material and cool the abrasive product surface (110).

20. The abrasive product (100) according to any of the claims 1 to 19, comprising a foam layer (123) attached to the backing layer (101) to convey air or liquid.

21. The abrasive product (100) according to claim 20, wherein the openings (226) are in contact with the foam layer (123) to convey air, liquid or abraded material between the foam layer and the abrasive product surface (110).

22. An apparatus (300) comprising an abrasive product (100) according to any of the claims 1 to 21.

23. Use of an abrasive product (100) according to any of the claims 1 to 21 with a fluid comprising water to convey abraded material away.

24. Use of an abrasive product (100) according to any of the claims 1 to 21 in an apparatus (300) for machine abrasion.

25. A method to obtain a flexible abrasive product, the method comprising

- providing a backing layer (101) and
- forming multiple abrasive zones (118) supported by the backing layer (101),

wherein each abrasive zone (118) is surrounded by interconnected channel portions (221, 222) having substantially constant transverse dimensions (td1, td2) along the channel portion lengths, wherein the transverse dimension (td1, td2) is width (w1, w2) by height (h1, h2), the channel portions (221, 222) comprising different widths (w1, w2) such that the channel portions (221, 222) comprise first channel portions (221) with a substantially constant first channel width (w1) and second channel portions (222) with a substantially constant second channel width (w2).

26. A method to obtain a flexible abrasive product (100), the method comprising

- providing a backing layer (101) and
- forming repeating units (RU1, RU2, RU3, RU4, RU5, RU6, RU7) of abrasive zones (118) surrounded by channel portions (221, 222) on the backing layer (101), wherein the repeating unit (RU1, RU2, RU3, RU4, RU5, RU6, RU7) boundaries opposite to each other have congruent curvature to form a complementary pair to fit the repeating units (RU1, RU2, RU3, RU4, RU5, RU6, RU7) together in a pre-emptying manner and the channel portions (221, 222) comprise first channel portions (221) with a substantially constant first channel width (w1) and second channel portions (222) with a substantially constant second channel width (w2) along the channel portion length.

27. The method according to claim 25 or 26, wherein the backing layer (101) comprises one or more functional layers (102, 103, 104, 104, 105, 106, 107, 108) formed by die casting, extruding, co-extruding or injection moulding.

28. The method according to any of the claims 25 to 27, further comprising increasing the surface tension of the backing layer (101) by a corona, plasma or flame treatment.

29. The method according to claim any of the claims 25 to 28, further comprising applying a friction coating to a second side 108 of the backing layer 101

30. The method according to any of the claims 25 to 29, further comprising providing the backing layer (101) with recessed areas (201, 202, 203) for conveying water or abraded material away.

31. The method according to any of the claims 25 to 30, further comprising arranging the position of the recessed areas (201, 202, 203) on the backing layer (101) substantially coincide with the position of the second channel portions (222) to increase the volume of the second channel portions (222).

32. The method according to claim any of the claims 25 to 31, further comprising forming openings (226) extending through the backing layer (101), the openings (226) positioned on recessed areas (201, 202, 203) and comprising an opening width (w3) equal to or less than the width of the recessed area and a maximum opening length (L3) equal to the maximum length (L5) of the second channel portions (202).

33. The method according to claim any of the claims 25 to 32, wherein the backing layer (101) comprises a polypropylene homopolymer, a random copolymer of propylene and ethylene or a propylene and an alkene, a block copolymer of propylene and ethylene or alternatively propylene and an alkene.

34. The method according to any of the claims 27 to 33, wherein a functional layer (102, 103, 104, 104, 105, 106, 107, 108) comprises an adhesion promoting compound selected from the group consisting of high density

ethylene copolymer, low density ethylene copolymer, ethylene-butyl acrylate (EBA) copolymer, ethylene vinyl acetate (EVA) copolymer, ethylene methyl acrylate (EMA) copolymer, ethylene butyl acrylate (EBA) copolymer, 2-ethyl hexyl acrylate (2EHA) copolymer, ethylene acrylic ester terpolymer where the acrylic ester type is a methyl, ethyl or butyl acrylate, ethylene vinyl acetate terpolymer where the acrylic ester type is a methyl, ethyl or butyl acrylate.

35. The method according to claim any of the claims 25 to 34, further comprising providing the backing layer (101) with elevated areas (206).

36. The method according to claim 35, wherein the elevated areas (206) are provided by calendaring the surface of the backing layer (101).

37. The method according to claim 35, wherein the elevated areas (206) are provided by applying an abrasive coating on a backing layer (101).

38. The method according to claim 35, wherein the elevated areas (206) are provided by calendaring the surface of the backing layer (101) and applying an abrasive coating on a calendared backing layer (101) surface.

39. An abrasive product (100) obtained according to any of the claims 25 to 38.

Claims:

1. A flexible abrasive product surface comprising repeating units of abrasive zones surrounded by channel portions, wherein repeating unit boundaries opposite to each other have congruent curvature to form a complementary pair to fit the repeating units together in a pre-emptying manner and the channel portions comprise first channel portions with a substantially constant first channel width and second channel portions with a substantially constant second channel width along the channel portion length.

2. The abrasive product surface according to claim 1, wherein multiple repeating units are arranged in a pre-emptying manner for filling the whole surface of the abrasive product.

3. The abrasive product surface according to claim 1 or 2, wherein the repeating units comprise self-similar or a congruent shapes.

4. The abrasive product according to claim 1, wherein the abrasive zones have congruent shapes.

5. The abrasive product according to claim 1, further comprising a backing layer, wherein the abrasive zones are supported by the backing layers, and an abrasive layer adjoined to the backing layer and comprising the first channel portions, the second channel portions and multiple abrasive zones.

6. The abrasive product according to claim 5, wherein recessed areas matching the second channel portions are provided on the backing layers.

7. The abrasive product according to claim 6, wherein the position of the recessed areas on the backing layer substantially coincides with the position of the second channel portions on the abrasive layer to increase the volume of the second channel portions.

8. The abrasive product according to claim 5, comprising openings extending through the backing layer and an abrasive layer with a maximum opening

width equal to the second channel width and a maximum opening length equal to the maximum length of the second channel portions.

9. The abrasive product according to any one of claims 5 to 8, comprising a foam layer attached to the backing layer to convey air or liquid.

10. The abrasive product according to claim 9, wherein the openings are in contact with the foam layer to convey air, liquid or abraded material between the foam layer and the abrasive product surface.

11. An apparatus comprising an abrasive product according to any of the claims 1 to 10.

12. Use of an abrasive product according to any of the claims 1 to 10 with a fluid comprising water to convey abraded material away.

13. Use of an abrasive product according to any of the claims 1 to 10 in an apparatus for machine abrasion.

14. A method to obtain an abrasive product, the method comprising

- providing a backing layer; and
- forming repeating units of abrasive zones surrounded by channel portions on the backing layer; wherein the repeating unit boundaries opposite to each other have congruent curvature to form a complementary pair to fit the repeating units together in a pre-emptying manner and the channel portions comprise first channel portions with a substantially constant first channel width and second channel portions with a substantially constant second channel width along the channel portion length.

15. The method according to claim 14, wherein the backing layer comprises one or more functional layers formed by die casting, extruding, co-extruding or injection moulding.

16. The method according to claim 14 or 15, further comprising increasing the surface tension of the backing layer by a corona, plasma or flame treatment.

17. The method according to any of the claims 14 to 16, further comprising applying a friction coating to a second side of the backing layer.

18. The method according to any of the claims 14 to 17, further comprising providing the backing layer with recessed areas for conveying water or abraded material away.

19. The method according to any of the claims 14 to 18, further comprising arranging the position of the recessed areas on the backing layer substantially coincide with the position of the second channel portions to increase the volume of the second channel portions.

20. The method according to any of the claims 14 to 19, further comprising forming openings extending through the backing layer, the openings positioned on recessed areas and comprising an opening width equal to or less than the width of the recessed area and a maximum opening length equal to the maximum length of the second channel portions.

21. The method according to any of the claims 14 to 20, wherein the backing layer comprises a polypropylene homopolymer, a random copolymer of propylene and ethylene or a propylene and an alkene, a block copolymer of propylene and ethylene or alternatively propylene and an alkene.

22. The method according to any of the claims 14 to 21, wherein a functional layer comprises an adhesion promoting compound selected from the group consisting of high density ethylene copolymer, low density ethylene copolymer, ethylene-butyl acrylate (EBA) copolymer, ethylene vinyl acetate (EVA) copolymer, ethylene methyl acrylate (EMA) copolymer, ethylene butyl acrylate (EBA) copolymer, 2-thyl hexyl acrylate (2EHA) copolymer, ethylene acrylic ester terpolymer where the acrylic ester type is a methyl, ethyl or butyl acrylate, ethylene vinyl acetate terpolymer where the acrylic ester type is a methyl, ethyl or butyl acrylate.

23. The method according to any of the claims 14 to 22, further comprising providing the backing layer with elevated areas.

24. The method according to claim 23, wherein the elevated areas are provided by calendaring the surface of the backing layer.

25. The method according to claim 23, wherein the elevated areas are provided by applying an abrasive coating on a backing layer.

26. The method according to claim 23, wherein the elevated areas are provided by calendaring the surface of the backing layer and applying an abrasive coating on a calendared backing layer surface.

27. An abrasive product obtained according to any of the claims 23 to 26.