Claims

1. A method of making aerosol-forming rods having predetermined values of cross-sectional porosity and cross-sectional porosity distribution value for use as aerosol-forming substrates in heated aerosol-generating articles, the method comprising the steps of:

providing a continuous sheet of aerosol-forming material having a specified width and a specified thickness,

gathering the continuous sheet of aerosol-forming material transversely relative to the longitudinal axis thereof,

circumscribing the gathered continuous sheet of aerosol-forming material with a wrapper to form a continuous rod,

severing the continuous rod into a plurality of discrete rods,

determining values representative of cross-sectional porosity and cross-sectional porosity distribution for at least one of the discrete rods, and

controlling one or more manufacturing parameters to ensure that the cross-sectional porosity and cross-sectional porosity distribution values of subsequent rods are within the predetermined values to produce the aerosol-forming rods.

2. A method according to claim 1 comprising the step of crimping the continuous sheet of aerosol-forming material before the step of gathering the continuous sheet of aerosol-forming material.

3. A method according to claim 1 or 2 in which one or more parameters selected from the list consisting of width of the continuous sheet of aerosol-forming material, thickness of the continuous sheet of aerosol-forming material, diameter of rod, width of crimping applied to the continuous sheet of aerosol-forming material, and depth of crimping the continuous sheet of aerosol-forming material, are controlled to provide the aerosol-forming rods having the predetermined values of cross-sectional porosity and cross-sectional porosity distribution.

4. A method according to claim 1, 2 or 3 comprising the step of determining values of cross-sectional porosity and cross-sectional porosity distribution for at least one of the discrete rods and, if the values are not within desired predetermined values, varying the one or more parameters to change the values of cross-sectional porosity and cross-sectional porosity distribution in subsequent rods to provide the aerosol-forming rods having the predetermined values of cross-sectional porosity and cross-sectional porosity distribution.

5. A method according to any preceding claim in which the sheet of aerosol-forming material is a sheet of tobacco material comprising tobacco and an aerosol former.

6. A method according to any of claims 1 to 4 in which the sheet of aerosol-forming material is a non-tobacco material comprising a nicotine salt.

7. A method according to any preceding claim in which the diameter of the rods formed is between 5 mm and 10 mm, preferably between 6 mm and 9 mm, or between about 7 mm and about 8 mm.

8. A method according to any preceding claim in which the specified width of the sheet of

aerosol forming material is between 70 mm and 250 mm, for example between 120 mm and 160 mm.

9. A method according to any preceding claim in which the specified thickness of the sheet of aerosol-forming material is between 50 micrometres and 300 micrometres, preferably between 150 micrometres and 250 micrometres.

10. A method according to any preceding claim in which the continuous sheet of aerosol-forming material is a crimped sheet of aerosol-forming material and has a crimping depth of between 50 micrometres and 300 micrometres, preferably between 100 and 250 micrometres.

11. A method according to any preceding claim in which a cross-sectional porosity distribution value is determined by a method comprising the steps of, obtaining a digital image of a transverse cross-sectional area of the rod, determining the area fraction of voids present within each of a plurality of identically dimensioned sub-areas of the transverse area, thereby obtaining a porosity value for each of the plurality of identically dimensioned sub-areas, and calculating the standard deviation of the porosity values for each of the plurality of identically dimensioned sub-areas, in which each sub-area overlaps at least one adjacent sub-area by between 10% and 95%.

12. A method according to claim 11 in which the rod has a diameter and each of the sub-areas is a rectangle or square with a length of between a quarter and an eighth of the diameter of the rod, preferably about a sixth or a seventh of the diameter of the rod.

13. A method according claim 11 or 12 in which each sub-area overlaps at least one adjacent sub-area by between 75% and 85%, preferably about 80%.

14. A method according to claim 11, 12, or 13, in which the porosity value of any individual sub-area is only included in the calculation for evaluating porosity distribution if more than 90% of that sub-area is within the transverse cross-sectional area of the rod.

15. A method according to any of claims 11 to 14, in which the digital image of the transverse cross-sectional area consists of a plurality of pixels, and every pixel making up the transverse cross-sectional area is contained within at least one of the plurality of sub-areas.

16. A method according to any preceding claim in which the one or more manufacturing parameters are controlled to produce aerosol-forming rods having a cross-sectional porosity of between about 0.15 and about 0.50, preferably between about 0.20 and about 0.45, preferably between about 0.24 and about 0.44, the cross-sectional porosity being the area fraction of void space of the transverse cross-sectional area of the rod, the transverse cross-sectional area being the area of the rod in a plane perpendicular to the longitudinal axis of the rod.

17. A method according to any preceding claim in which the one or more manufacturing parameters are controlled to produce rods having a cross-sectional porosity distribution value of between about 0.04 and about 0.22, the cross-sectional porosity distribution value being the standard deviation of void space within each of a plurality of identically dimensioned sub-areas of the transverse cross-sectional area.

18. A method according to any preceding claim comprising the further steps of: assembling an aerosol-forming rod with a plurality of other components within a wrapper to form a heated aerosol-generating article.

19. A method according to claim 18 in which the values of cross-sectional porosity and cross-sectional porosity distribution of the aerosol-forming rod are selected to provide a predetermined resistance to draw through the assembled heated aerosol-generating article.

20. A method according to claim 18 or 19 in which the aerosol-forming material comprises nicotine, and the values of cross-sectional porosity and cross-sectional porosity distribution of the aerosol-forming rod are selected to provide predetermined levels of nicotine delivery from the assembled heated aerosol-generating article when consumed.

21. An aerosol-forming rod formed using a method according to any of claims 1 to 17 having a cross-sectional porosity of between about 0.15 and about 0.50, preferably between about 0.20 and about 0.45, preferably between about 0.24 and about 0.44, the cross-sectional porosity being the area fraction of void space of the transverse cross-sectional area of the rod, the transverse cross-sectional area being the area of the rod in a plane perpendicular to the longitudinal axis of the rod.

22. An aerosol-forming rod according to claim 21 having a cross-sectional porosity distribution value of between about 0.04 and about 0.22, the cross-sectional porosity distribution value being the standard deviation of void space within each of a plurality of identically dimensioned sub-areas of the transverse cross-sectional area.

23. A heated aerosol-generating article comprising a plurality of elements, including an aerosol-forming substrate in the form of an aerosol-forming rod as defined in claim 21 or 22 or a rod manufactured by a method as disclosed in any of claims 1 to 17.

24. A heated aerosol-generating article according to claim 23 in which the plurality of elements are assembled within a wrapper.

25. A heated aerosol-generating article according to claim 23 or 24 in which the aerosol-forming substrate comprises nicotine and the cross-sectional porosity and cross-sectional porosity distribution value of the aerosol-forming substrate are selected to provide predetermined levels of nicotine delivery when the heated aerosol-generating article is consumed.

26. A heated aerosol-generating article according to claim 23, 24, or 25 that is configured to be heated by an insertable heater of an aerosol-generating device, in which the aerosol-forming substrate is a rod having a cross-sectional porosity of between about 0.20 and about 0.40, preferably between about 0.24 and about 0.34, and a cross-sectional porosity distribution value of between about 0.10 and about 0.12.

27. A heated aerosol-generating article according to claim 23, 24, or 25 comprising a combustible heat source for heating the aerosol-forming substrate, in which the aerosol-forming substrate is a rod having a cross-sectional porosity of between about 0.20 and about 0.40, preferably between about 0.34 and about 0.44, and a cross-sectional porosity distribution value of between about 0.11 and about 0.15.