Claims

1. A method of forming a polymer coating on a substrate (1), the method comprising the steps of:
providing in an evacuated reaction chamber (3) a substrate (1) having a surface (2) to be coated;
providing a first source (5) of polymer forming material (6) and a second source (7) of radicals (8);
~~characterized in that~~
the first source (5) and the second source (7) ~~are~~ being separated from each other and from the reaction chamber (3), and are in fluid communication with a first conduit means (9) and a second conduit means (10) ~~and in that~~
the polymer forming material (6) and the radicals (8) ~~are~~ being ~~at least temporarily~~ conducted contemporaneously but spatially separated to the substrate's surface (2), so that a reaction of the polymer forming material (6) with the radicals (8) is avoided before they reach the substrate's surface (2),
characterized in that
said first conduit means (9) and said second conduit means (10) are arranged in an alternating manner face to the surface (2) to be coated and in lines.

2. The method according to claim 1, wherein the polymer forming material (6) is conducted via first conduit means (9) to the substrate's surface (2) to be coated and the radicals (8) are conducted via second conduit means (10) to the substrate's surface (2) to be coated.

3. The method according to claim 1 or 2, wherein the polymer forming material (6) and the radicals (8) are each sprayed essentially perpendicularly onto the substrate's surface (2).

4. The method according to one of the preceding claims, wherein the polymer forming material (6) and the radicals (8) are at least partially sprayed onto the substrate's surface (2) in the form of essentially parallel streams (13, 14), and wherein the streams (13) of polymer forming material (6) and the streams (14) of radicals (8) are sprayed onto the substrate's surface (2) in a spatially alternating manner.

5. The method according to one of the preceding claims, wherein the polymer forming material (6) and the radicals (8) are separately guided by conduit means (9, 10) until a distance (D) of less than 2 cm, preferably of less than 1 cm, and more preferably of less than 0.5 cm from the substrate's surface (2) and are then sprayed onto the substrate's surface (2).

6. A device (100) for forming a polymer coating on a substrate's surface (2), preferably according to a method of one of claims 1 to 5, the device comprising:
a reaction chamber (3) for accommodating the substrate (1) to be coated;
a first source (5) for providing polymer forming material (6);
a second source (7) for providing radicals (8);

said first source (5) and said second source (7) being in fluid communication with a first conduit means (9) and a second conduit means (10), respectively
characterized in that the device (100) further comprises:
a conduit system (4) for contemporaneously and spatially separately conducting the polymer forming material (6) and the radicals (8) from each source (5, 7) to the substrate's surface (2) to be coated, such that a reaction of the polymer forming material (6) and the radicals (8) is avoided before they reach the substrate's surface (2),
wherein said first conduit means (9) and said second conduit means (10) are arranged in an alternating manner face to the surface (2) to be coated and in lines.

7. The device according to claim 6, wherein the conduit system (4) comprises fluidly separated first (9) and second (10) conduit means, wherein the first conduit means (9) are in fluid communication with the first source (5) and the second conduit means (10) are in fluid communication with the second source (7), and wherein the first conduit means (9) comprise a plurality of first outlets (11) for spraying polymer forming material (6) onto the substrate's surface (2) and the second conduit means (10) comprise a plurality of second outlets (12) for spraying the radicals (8) onto the substrate's surface (2).

8. The device according to claim 7, wherein the first outlets (11) and the second outlets (12) are arranged essentially in a plane opposite, and preferably essentially parallel, to the substrate's surface (2) to be coated.

9. The device according to claim 8, wherein the first outlets (11) and the second outlets (12) are alternatingly arranged in at least a part of the plane.

10. The device according to one of claims 7 to 9, wherein the conduit system (4) comprises a first inlet in fluid communication with the first source (5) and a second inlet in fluid communication with the second source (7) and wherein the plurality of first outlets (11) is only in fluid communication with the first inlet and the plurality of second outlets (12) is only in fluid communication with the second inlet.

11. The device according to one of claims 7 to 10, wherein the outlets (11, 12) are arranged such that an outlet of the plurality of first outlets (11) is adjacent to at least two outlets of the plurality of second outlets (12), or vice versa.

12. The device according to one of claims 7 to 11, wherein the smallest distance (D) from an outlet (11, 12) to the substrate's surface (2) is smaller than 20 mm and preferably smaller than 10 mm and more preferably smaller than 5 mm.

13. The device according to one of claims 7 to 12, wherein the first conduit means (9) and the second conduit means (10) are adapted to supply essentially parallel flows to the outlets (11, 12) for spraying essentially parallel streams (13, 14) perpendicularly onto the substrate's surface (2) to be coated.

14. The device according to one of claims 7 to 13, wherein the first conduit means (9) comprise a first comb-shaped member (15) having a plurality of first parallel, hollow teeth (17) and wherein the second conduit means (10) comprise a second comb-shaped member (16) having a plurality of second parallel, hollow teeth (18), the first and second comb-shaped members' teeth (17, 18) engaging one another, and wherein the teeth (17) of the first comb-shaped member (15) comprise the plurality of first outlets (11') and the teeth (18) of the second comb-shaped member (16) comprise the plurality of second outlets (12').

15. The device according to one of claims 7 to 13, wherein
the outlets (11, 12) are alternatingly arranged in honeycomb pattern or in a checkerboard pattern; and/or wherein
the outlets' (11, 12) cross-sections are one or more of: hexagonal, circular, elliptic, rectangular, triangular, star-shaped and polygonal.

Claims

1. A method of forming a polymer coating on a substrate (1), the method comprising the steps of:
providing in an evacuated reaction chamber (3) a substrate (1) having a surface (2) to be coated;
providing a first source (5) of polymer forming material (6) and a second source (7) of radicals (8);
the first source (5) and the second source (7) being separated from each other and from the reaction chamber (3), and are in fluid communication with a first conduit means (9) and a second conduit means (10)
the polymer forming material (6) and the radicals (8) being conducted contemporaneously but spatially separated to the substrate's surface (2), so that a reaction of the polymer forming material (6) with the radicals (8) is avoided before they reach the substrate's surface (2),
characterized in that
said first conduit means (9) and said second conduit means (10) are arranged in an alternating manner face to the surface (2) to be coated and in lines.

2. The method according to claim 1, wherein the polymer forming material (6) is conducted via first conduit means (9) to the substrate's surface (2) to be coated and the radicals (8) are conducted via second conduit means (10) to the substrate's surface (2) to be coated.

3. The method according to claim 1 or 2, wherein the polymer forming material (6) and the radicals (8) are each sprayed essentially perpendicularly onto the substrate's surface (2).

4. The method according to one of the preceding claims, wherein the polymer forming material (6) and the radicals (8) are at least partially sprayed onto the substrate's surface (2) in the form of essentially parallel streams (13, 14), and wherein the streams (13) of polymer forming material (6) and the streams (14) of radicals (8) are sprayed onto the substrate's surface (2) in a spatially alternating manner.

5. The method according to one of the preceding claims, wherein the polymer forming material (6) and the radicals (8) are separately guided by conduit means (9, 10) until a distance (D) of less than 2 cm, preferably of less than 1 cm, and more preferably of less than 0.5 cm from the substrate's surface (2) and are then sprayed onto the substrate's surface (2).

6. A device (100) for forming a polymer coating on a substrate's surface (2), preferably according to a method of one of claims 1 to 5, the device comprising:
a reaction chamber (3) for accommodating the substrate (1) to be coated;
a first source (5) for providing polymer forming material (6);
a second source (7) for providing radicals (8);

said first source (5) and said second source (7) being in fluid communication with a first conduit means (9) and a second conduit means (10), respectively
characterized in that the device (100) further comprises:
a conduit system (4) for contemporaneously and spatially separately conducting the polymer forming material (6) and the radicals (8) from each source (5, 7) to the substrate's surface (2) to be coated, such that a reaction of the polymer forming material (6) and the radicals (8) is avoided before they reach the substrate's surface (2),
wherein said first conduit means (9) and said second conduit means (10) are arranged in an alternating manner face to the surface (2) to be coated and in lines.

7. The device according to claim 6, wherein the conduit system (4) comprises fluidly separated first (9) and second (10) conduit means, wherein the first conduit means (9) are in fluid communication with the first source (5) and the second conduit means (10) are in fluid communication with the second source (7), and wherein the first conduit means (9) comprise a plurality of first outlets (11) for spraying polymer forming material (6) onto the substrate's surface (2) and the second conduit means (10) comprise a plurality of second outlets (12) for spraying the radicals (8) onto the substrate's surface (2).

8. The device according to claim 7, wherein the first outlets (11) and the second outlets (12) are arranged essentially in a plane opposite, and preferably essentially parallel, to the substrate's surface (2) to be coated.

9. The device according to claim 8, wherein the first outlets (11) and the second outlets (12) are alternatingly arranged in at least a part of the plane.

10. The device according to one of claims 7 to 9, wherein the conduit system (4) comprises a first inlet in fluid communication with the first source (5) and a second inlet in fluid communication with the second source (7) and wherein the plurality of first outlets (11) is only in fluid communication with the first inlet and the plurality of second outlets (12) is only in fluid communication with the second inlet.

11. The device according to one of claims 7 to 10, wherein the outlets (11, 12) are arranged such that an outlet of the plurality of first outlets (11) is adjacent to at least two outlets of the plurality of second outlets (12), or vice versa.

12. The device according to one of claims 7 to 11, wherein the smallest distance (D) from an outlet (11, 12) to the substrate's surface (2) is smaller than 20 mm and preferably smaller than 10 mm and more preferably smaller than 5 mm.

13. The device according to one of claims 7 to 12, wherein the first conduit means (9) and the second conduit means (10) are adapted to supply essentially parallel flows to the outlets (11, 12) for spraying essentially parallel streams (13, 14) perpendicularly onto the substrate's surface (2) to be coated.

14. The device according to one of claims 7 to 13, wherein the first conduit means (9) comprise a first comb-shaped member (15) having a plurality of first parallel, hollow teeth (17) and wherein the second conduit means (10) comprise a second comb-shaped member (16) having a plurality of second parallel, hollow teeth (18), the first and second comb-shaped members' teeth (17, 18) engaging one another, and wherein the teeth (17) of the first comb-shaped member (15) comprise the plurality of first outlets (11') and the teeth (18) of the second comb-shaped member (16) comprise the plurality of second outlets (12').

15. The device according to one of claims 7 to 13, wherein
the outlets (11, 12) are alternatingly arranged in honeycomb pattern or in a checkerboard pattern; and/or wherein
the outlets' (11, 12) cross-sections are one or more of: hexagonal, circular, elliptic, rectangular, triangular, star-shaped and polygonal.