

CLAIMS

1. Apparatus, comprising:
a support, comprising an outer surface and configured for insertion into a body of a subject;
- 5 multiple atoms of a radionuclide, which radioactively decays to produce a daughter radionuclide, coupled to the outer surface; and
a layer of a polymer, which is permeable to the daughter radionuclide, that covers the atoms.
2. The apparatus according to claim 1, wherein the atoms are disposed on the outer surface.
- 10 3. The apparatus according to any one of claims 1-2, wherein the support is cylindrically-shaped.
4. The apparatus according to any one of claims 1-3, wherein the radionuclide is an alpha-emitting radionuclide.
5. The apparatus according to any one of claims 1-4, wherein the radionuclide comprises an
15 isotope of radium selected from the group of isotopes consisting of: Ra-224 and Ra-223.
6. The apparatus according to any one of claims 1-5, wherein the daughter radionuclide is an alpha-emitting daughter radionuclide.
7. The apparatus according to any one of claims 1-6, wherein a thickness of the layer is between 0.1 and 2 microns.
- 20 8. The apparatus according to claim 7, wherein the thickness is between 0.1 and 1 microns.
9. The apparatus according to any one of claims 1-8, wherein a diffusion coefficient of the daughter radionuclide in the polymer is at least 10^{-11} cm²/sec.
10. The apparatus according to any one of claims 1-9, wherein the polymer is selected from the group of polymers consisting of: polypropylene, polycarbonate, polydimethylsiloxane,
25 polyethylene terephthalate, poly(methyl methacrylate), and polysulfone.
11. The apparatus according to any one of claims 1-10,
wherein the layer is an outer layer,
wherein the polymer is a first polymer, and
wherein the apparatus further comprises an inner layer of a second polymer, which is
30 permeable to the daughter radionuclide, coating the outer surface, the atoms being coupled to the outer surface by virtue of being coupled to the inner layer.

12. The apparatus according to claim 11, wherein an inner-layer thickness of the inner layer is between 0.1 and 2 microns.
13. The apparatus according to claim 12, wherein the inner-layer thickness is between 0.1 and 1 microns.
- 5 14. A method, comprising:
coupling multiple atoms of a radionuclide, which radioactively decays to produce a daughter radionuclide, to an outer surface of a support that is configured for insertion into a body of a subject; and
subsequently to coupling the atoms to the outer surface, covering the atoms with a layer
10 of a polymer that is permeable to the daughter radionuclide.
15. The method according to claim 14, wherein the support is cylindrically-shaped.
16. The method according to any one of claims 14-15, wherein covering the atoms comprises covering the atoms by withdrawing the support from a solution of the polymer such that the layer of the polymer coats the outer surface.
- 15 17. The method according to any one of claims 14-16, wherein the radionuclide is an alpha-emitting radionuclide.
18. The method according to any one of claims 14-17, wherein the radionuclide includes an isotope of radium selected from the group of isotopes consisting of: Ra-224 and Ra-223.
19. The method according to any one of claims 14-18, wherein the daughter radionuclide is
20 an alpha-emitting daughter radionuclide.
20. The method according to any one of claims 14-19, wherein a thickness of the layer is between 0.1 and 2 microns.
21. The method according to claim 20, wherein the thickness is between 0.1 and 1 microns.
22. The method according to any one of claims 14-21, wherein a diffusion coefficient of the
25 daughter radionuclide in the polymer is at least 10^{-11} cm²/sec.
23. The method according to any one of claims 14-22, wherein the polymer is selected from the group of polymers consisting of: polypropylene, polycarbonate, polydimethylsiloxane, polyethylene terephthalate, poly(methyl methacrylate), and polysulfone.
24. The method according to any one of claims 14-23,
30 wherein the layer is an outer layer,

wherein the polymer is a first polymer,

wherein the method further comprises, prior to coupling the atoms to the outer surface, coating the outer surface with an inner layer of a second polymer, and

wherein coupling the atoms to the outer surface comprises coupling the atoms to the outer surface by coupling the atoms to the inner layer.

25. The method according to claim 24, wherein an inner-layer thickness of the inner layer is between 0.1 and 2 microns.

26. The method according to claim 25, wherein the inner-layer thickness is between 0.1 and 1 microns.

27. A method, comprising:

inserting a radiation source into a body of a subject, the radiation source including:

a support, including an outer surface,

multiple atoms of a radionuclide, which radioactively decays to produce a daughter radionuclide, coupled to the outer surface, and

a layer of a polymer, which is permeable to the daughter radionuclide, that covers the atoms; and

leaving the radiation source within the body of the subject, such that nuclei of the daughter radionuclide diffuse through the layer of the polymer.

28. The method according to claim 27,

wherein the layer is an outer layer,

wherein the polymer is a first polymer, and

wherein the radiation source further comprises an inner layer of a second polymer, which is permeable to the daughter radionuclide, coating the outer surface, the atoms being coupled to the outer surface by virtue of being coupled to the inner layer.

29. The method according to any one of claims 27-28, wherein inserting the radiation source into the body of the subject comprises inserting the radiation source into a tumor inside the body of the subject.

30. The method according to any one of claims 27-28, wherein inserting the radiation source into the body of the subject comprises inserting the radiation source such that the radiation source is within 0.1 mm of a tumor inside the body of the subject.