

CLAIMS

1. A method for obtaining a container comprising ^{212}Pb on the walls comprising the steps of:
- 5 - providing an assembly comprising a first part and a second part, wherein the first part comprises a container and the second part comprises a ^{212}Pb precursor isotope source,
 - connecting the first part and the second part such that the ^{212}Pb precursor isotope source does not come into contact with an inner wall of the container and such that a single chamber container assembly is provided,
 - 10 - allowing the ^{212}Pb precursor isotope source sufficient time to decay to progenies ^{220}Rn , ^{216}Po , and/or ^{212}Pb , and sufficient time for ^{220}Rn , ^{216}Po and/or ^{212}Pb to settle onto the inner walls of the single chamber container assembly,
 - removing or isolating the remaining ^{212}Pb precursor isotope from the single chamber assembly without having the ^{212}Pb precursor isotope source come into contact with an inner wall of the single chamber container assembly, and
 - 15 - obtaining a container comprising ^{212}Pb on an inner wall of the container and substantially free of the ^{212}Pb precursor isotope source on the inner wall of the container.
2. An assembly comprising a first part and a second part, wherein the first part comprises a container and the second part comprises a ^{212}Pb precursor isotope source, wherein the first part
- 20 and the second part are connected such that the ^{212}Pb precursor isotope source does not come into contact with an inner wall of the container, and such that a single chamber container assembly is provided.
3. A single chamber container assembly comprising a first part and a second part, wherein the first
- 25 part comprises a container and the second part comprises a ^{212}Pb precursor isotope source, wherein the first part and the second part are connected such that the ^{212}Pb precursor isotope source does not come into contact with an inner wall of the container.
4. The method according to claim 1, the assembly according to claims 2-3, wherein the single
- 30 chamber container assembly is gas tight.

5. The method and the assembly according to any one of the preceding claims, wherein the ^{212}Pb precursor isotope source is selected from the group consisting of ^{232}Th , ^{228}Ra , ^{228}Ac , ^{228}Th and/or ^{224}Ra .
- 5 6. The method and the assembly according to any one of the preceding claims, wherein the ^{212}Pb precursor isotope source is a mixture of ^{232}Th , ^{228}Ra , ^{228}Ac , ^{228}Th and ^{224}Ra .
7. The method and the assembly according to any one of the preceding claims, wherein the ^{212}Pb precursor isotope source is a mixture of ^{228}Th and ^{224}Ra .
- 10 8. The method and the assembly according to any one of the preceding claims, wherein the ^{212}Pb activity is 0% to 114% of the ^{224}Ra precursor activity..
- 15 9. The method and the assembly according to any one of the preceding claims, wherein the ^{212}Pb activity is 0% to 103% of the ^{228}Th precursor activity..
10. The method and the assembly according to any one of the preceding claims, wherein the total amount of radioactivity in the single chamber container assembly is 1 kBq – 100 GBq.
- 20 11. The method and the assembly according to any one of the preceding claims, wherein the ^{212}Pb precursor isotope source is in the form of an inorganic or organic salt, such as RaCl_2 .
12. The method and the assembly according to any one of the preceding claims, wherein the ^{212}Pb precursor isotope source is bound to a non-radioactive material, such as particles or a holding material.
- 25 13. The method and the assembly according to any one of the preceding claims, wherein the ^{212}Pb precursor isotope source is in a dry form or in a liquid solution, such as an aqueous solution or a dispersion.

14. The method and the assembly according to any one of the proceeding claims, wherein the ^{212}Pb precursor isotope source is in a liquid solution that is at acidic, neutral or basic pH.
- 5 15. The method and the assembly according to any one of the proceeding claims, wherein the ^{212}Pb precursor isotope source is deposited on a sponge, a wool, a strip or a sphere that is made of a material suitable for application of a liquid.
- 10 16. The method and the assembly according to any one of the proceeding claims, wherein the ^{212}Pb precursor isotope source is deposited on a sponge, a wool, a strip or a sphere which is made of material that is selected from the group consisting of quartz, glass, mineral, paper, plastic, metal, ceramic, and natural or synthetic fibers.
- 15 17. The method and the assembly according to claims 15-16, wherein a strip or sphere is attached to the second part, which comprises means for holding the sponge, the wool, the strip or the sphere, such as a rod.
18. The method and the assembly according to claim 17, wherein the second part comprises a syringe, or wherein the rod is the syringe.
- 20 19. The method and the assembly according to claim 18, wherein the syringe tip has been pushed through a rubber cap.
- 25 20. The method and the assembly according to any one of the proceeding claims, wherein the second part comprises a rod that is attached to the means for opening and closing the container.
21. The method and the assembly according to claim 20, wherein the means for opening and closing the container is a cap, cover or a lid.
- 30 22. The method and the assembly according to claim 21, wherein the cap, cover or a lid is made of a material selected from the group consisting of quartz, glass, mineral, rubber, glass, paper, plastic, metal, ceramic, and natural or synthetic fibers.

23. The method and the assembly according to any one of the proceeding claims, wherein the ^{212}Pb precursor isotope source is placed on or in a sphere, suitable for holding the source but allowing radon diffusion.

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24. The method and the assembly according to any one of the proceeding claims, wherein the container comprises a gas permeable barrier impervious to the ^{212}Pb precursor isotope source.

25. The method and the assembly according to claim 24, wherein the gas permeable barrier
10 impervious to the ^{212}Pb precursor isotope source is in contact with the ^{212}Pb precursor isotope source.

26. The method and the assembly according to claims 1-23, wherein the container does not comprise a gas permeable barrier impervious to the ^{212}Pb precursor isotope source.

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27. The method and the assembly according to any one of the proceeding claims, wherein volume of the container is 1 μl to 10 liters, such as 1 μl to 1 liter, such as 100 μl to 10 ml, such as 100 μl to 100 ml.

20 28. The method and the assembly according to any one of the proceeding claims, wherein substantially free of the ^{212}Pb precursor isotope source on the inner wall of the container is defined as less than 3 % ^{224}Ra of the ^{212}Pb precursor isotope source, such as less than 1 %, such as less than 0,5 %, as measured as % relative radioactivity.

25 29. The method and the assembly according to any one of the proceeding claims, wherein the inner walls of the container are coated.

30 30. The method and the assembly according to any one of the proceeding claims, wherein the inner walls of the container are coated with a compound that comprises a chelator which can complex with ^{212}Pb .

31. The method and the assembly according to any one of the proceeding claims, wherein the inner walls of the container are coated with a chelator which is TCMC or a variant hereof.

5 32. The method and the assembly according to any one of the proceeding claims, wherein the container comprises an aqueous or an oil solution.

33. The method and the assembly according to any one of the proceeding claims, wherein the second part of the assembly comprises a piston that can be in open and closed positions.

10 34. The method and the assembly according to any one of the proceeding claims, wherein the second part of the assembly comprises a chamber with a gas tight o-ring seal.

35. The method and the assembly according to any one of the proceeding claims, wherein the second part of the assembly comprises a gas and liquid tight lid or valve.

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36. The method and the assembly according to any one of the proceeding claims, wherein the assembly is made by a glass flask placed up-side down and with quartz wool with ^{224}Ra or ^{228}Th placed in the center of the inside of the cap.

20 37. A method of obtaining a ^{212}Pb solution comprising obtaining a container or assembly comprising ^{212}Pb on the walls according to any of the previous claims, and subsequently collect the ^{212}Pb in a solution.

25 38. A method of obtaining a ^{212}Pb solution comprising obtaining a glass flask assembly according to claim 37, unscrewing the flask standing up-side down from the cap with the source, and thereafter washing the interior of the flask with a solution to dissolve ^{212}Pb .