CLAIMS

1. A method of accumulating radium radionuclides, comprising:

providing a first solution including thorium radionuclides and a thorium-binding extractant, wherein the first solution does not bind to radium, such that radium atoms resulting from decay of the thorium radionuclides diffuse out of the first solution;

allowing a portion of the thorium radionuclides in the first solution to decay into radium atoms;

allowing the radium atoms to diffuse out of the first solution; and

collecting radium atoms resulting from the decay that diffused out of the first solution.

2. The method of claim 1, wherein the thorium-binding extractant comprises TOPO (tri-octyl phosphine Oxide).

3. The method of claim 1 or claim 2, wherein collecting the radium atoms comprises collecting the radium atoms into a second solution.

4. The method of claim 1 or claim 2, wherein collecting the radium atoms comprises collecting the radium atoms onto a brachytherapy source.

5. The method of claim 4, wherein collecting the radium atoms comprises collecting the radium atoms into a second solution and dipping the brachytherapy source into the second solution.

6. The method of any of claims 1-5, wherein providing the first solution comprises introducing the first solution into a chamber with a second solution, which does not mix with the first solution, such that the decay radium atoms diffuse into the second solution.

7. The method of claim 6, wherein providing the first solution comprises providing a solution including a diluent having a low level of solubility with the second solution.

8. The method of claim 7, wherein the diluent has a specific weight lower than the specific weight of water.

9. The method of claim 7, wherein the diluent comprises cyclohexane.

10. The method of any of claims 6-9, wherein the second solution comprises a salt solution.

11. The method of claim 1 or claim 2, wherein allowing a portion of the thorium radionuclides to decay into radium atoms comprises leaving the first solution in a chamber with walls from a material which attracts radium for a decay period, and wherein collecting the radium atoms comprises washing the radium atoms off the walls using a salt solution.

12. The method of any of claims 1-11, wherein allowing a portion of the thorium radionuclides to decay into radium atoms comprises placing the first solution in a chamber from which radium atoms are detachable without using an acid of pH lower than 4.

13. The method of any of claims 1-12, wherein providing the first solution comprises:

providing a separation solution of a diluent having a low level of solubility and a thorium-binding extractant;

combining the prepared separation solution with an initial solution including thorium radionuclides, so that thorium radionuclides from the initial solution bind to the thorium-binding extractant; and

separating the separation solution from the initial solution, to form the first solution.