WHAT IS CLAIMED IS:

1. An ultrafine bubble generating method, comprising:

dissolving a predetermined gas component into a liquid at a desired concentration; and

generating ultrafine bubbles smaller than 1.0 μm in diameter containing the predetermined gas component by causing a heating element provided in the liquid in which the gas component is dissolved in the dissolving step to generate heat, making film boiling on an interface between the liquid and the heating element, and generating a film boiling bubble.

2. The ultrafine bubble generating method according to claim 1, further comprising:

collecting the liquid containing the ultrafine bubbles generated in the generating step.

3. The ultrafine bubble generating method according to any one of claims 1 to 2, characterized by

the ultrafine bubbles include at least one of first ultrafine bubbles generated near a surface of the film boiling bubble when the film boiling bubble is expanded, second ultrafine bubbles generated near the surface of the film boiling bubble when the film boiling bubble shrinks, third ultrafine bubbles generated near a surface of the heating element when the film boiling bubble shrinks, and fourth ultrafine bubbles generated in a region in which a shock wave that is made when the film boiling bubble disappears is propagated.

4. The ultrafine bubble generating method according to any one of claims 1 to 2, characterized by the ultrafine bubbles are generated in a case where a gas dissolved in the liquid exceeds a thermal dissolution limit, and undergoes phase transition.

5. The ultrafine bubble generating method according to any one of claims 1 to 2, characterized by the ultrafine bubbles are generated in a case where a gas dissolved in the liquid exceeds a pressure dissolution limit, and undergoes phase transition.

6. The ultrafine bubble generating method according to any one of claims 1 to 5, wherein the gas component is dissolved in the dissolving step until the solubility of the gas component reaches almost the maximum saturation solubility.

7. The ultrafine bubble generating method according to any one of claims 1 to 6, wherein the driving unit configured to drive the heating element by applying a predetermined voltage pulse to the heating element.

8. An ultrafine bubble generating apparatus, comprising:

a dissolving unit configured to dissolve a predetermined gas component into a liquid at a desired concentration;

a heating element provided in the liquid; and

a driving unit configured to drive the heating element, wherein

the ultrafine bubble generating apparatus is configured to generates ultrafine bubbles smaller than 1.0 μm in diameter containing the predetermined gas component by causing with the driving unit the heating element provided in the liquid in which the gas component is dissolved by the dissolving unit to generate heat, making film boiling on an interface between the liquid and the heating element, and generating a film boiling bubble.

9. The ultrafine bubble generating apparatus according to claim 8, further comprising:

a collecting unit configured to collect the liquid containing the generated ultrafine bubbles.

10. The ultrafine bubble generating apparatus according to claims 8 or 9, characterized by

the ultrafine bubbles include at least one of first ultrafine bubbles generated near a surface of the film boiling bubble when the film boiling bubble is expanded, second ultrafine bubbles generated near the surface of the film boiling bubble when the film boiling bubble shrinks, third ultrafine bubbles generated near a surface of the heating element when the film boiling bubble shrinks, and fourth ultrafine bubbles generated in a region in which a shock wave that is made when the film boiling bubble disappears is propagated.

11. The ultrafine bubble generating apparatus according to claims 8 or 9, characterized by the ultrafine bubbles are generated in a case where a gas dissolved in the liquid exceeds a thermal dissolution limit, and undergoes phase transition.

12. The ultrafine bubble generating apparatus according to claims 8 or 9, characterized by the ultrafine bubbles are generated in a case where a gas dissolved in the liquid exceeds a pressure dissolution limit, and undergoes phase transition.

13. The ultrafine bubble generating apparatus according to any one of claims 8 to 12, wherein the dissolving unit is configured to dissolve the gas component until the solubility of the gas component reaches almost the maximum saturation solubility.

14. The ultrafine bubble generating apparatus according to any one of claims 8 to 13, wherein the heating element includes a plurality of surface reforming regions with a relatively high surface roughness and a non-surface reforming region with a relatively low surface roughness, and the film boiling bubble is generated in each of the plurality of surface reforming regions by heat generation of the heating element.

15. The ultrafine bubble generating apparatus according to claim 14, wherein the surface roughness of the surface reforming regions is double or more that of the non-surface reforming region.

16. The ultrafine bubble generating apparatus according to any one of claims 8 to 13, wherein a plurality of the heating elements are arrayed at predetermined intervals, and the film boiling bubbles generated in the adjacent heating elements are connected with each other in a process of expansion.

17. The ultrafine bubble generating apparatus according to claim 16, wherein the predetermined intervals are each 5 μm or less.

18. The ultrafine bubble generating apparatus according to any one of claims 8 to 13, wherein the liquid is stored in a flow passage formed by opposing flow passage walls, and the film boiling bubble is expanded and shrinks while being restricted by the flow passage walls.

19. The ultrafine bubble generating apparatus according to claim 18, wherein a shrinking speed of portions of the film boiling bubble close to the flow passage walls is slower than a shrinking speed of a portion away from the flow passage walls.

20. The ultrafine bubble generating apparatus according to claim 18, wherein a fluid resistance element as a fluid resistance is further formed in the flow passage.

21. The ultrafine bubble generating apparatus according to claim 20, wherein a shrinking speed of the film boiling bubble is substantially equal in a direction orthogonal to the flow passage walls.

22. The ultrafine bubble generating apparatus according to claim 20, wherein a shrinking speed of a portion of the film boiling bubble away from the flow passage walls is slower than a shrinking speed of portions close to the flow passage walls.

23. The ultrafine bubble generating apparatus according to any one of claims 8 to 22, wherein the driving unit configured to drive the heating element by applying a predetermined voltage pulse to the heating element.