

CLAIMS

What is claimed is:

1. An emulsification device comprising:
 - (a) a cylindrical outer part with two open ends;
 - 5 (b) a cylindrical inner part with a bottom and having a circumference sufficient to allow the inner part to be nested within the outer part of the emulsification device, wherein the inner part and the outer part are capable of sliding freely;
 - 10 (c) at least one groove on an interior surface of the outer part or on an exterior surface of the inner part, the groove having a height greater than a gap between the outer part and the inner part when nested;
 - (d) at least one hole in the inner part adjacent to the solid bottom;
 - 15 (e) a radial distribution channel on the interior surface of the outer part or on the exterior surface of the inner part; and
 - (f) a radial nozzle channel at the base of the interior surface of the outer part or at the base of the exterior surface of the inner part.
- 20 2. The emulsification device of any one of claim 1, wherein the emulsification device is injection molded.
3. The emulsification device of any one of claims 1 and 2, wherein the emulsification device is inserted into a container for use.
- 25 4. The emulsification device of any one of claims 1-3, wherein the container is a polymerase chain reaction (PCR) tube.
5. The emulsification device of any one of claims 1-4, wherein the container is a plate with a plurality of wells.
- 30 6. The emulsification device of any one of claims 1-5, wherein the at least one groove is on the interior surface of the outer part.

7. The emulsification device of any one of claims 1-5, wherein the at least one groove is on the exterior surface of the inner part.
- 5 8. The emulsification device of any one of claims 1-7, wherein the at least one groove is closed off to form a channel when the inner part is nested within the outer part.
9. The emulsification device of any one of claims 1-8, wherein the at least one groove is vertical while the device is in use.
- 10 10. The emulsification device of any one of claims 1-9, wherein the at least one groove is horizontal while the device is in use.
11. The emulsification device of any one of claims 1-10, wherein the at least one groove has a length of about 1 mm, a depth selected from the range of 0.01 mm to 0.5 mm, and a width selected from the range of 0.04 mm to 2 mm.
- 15 12. The emulsification device of any one of claims 1-11, wherein the radius of the inner part and the radius of the outer part differ by less than the depth of the at least one groove.
- 20 13. The emulsification device of any one of claims 1-12, wherein the radial distribution channel is about 0.5 mm above the bottom of the inner part.
- 25 14. The emulsification device of any one of claims 1-13, wherein the radial distribution channel has a depth between about 10 μm and about 0.2 mm.
- 30 15. The emulsification device of any one of claims 1-14, wherein the radial distribution channel is about 0.2 mm deep.

16. The emulsification device of any one of claims 1-14, wherein the radial distribution channel has a depth of about 10 μm .
- 5 17. The emulsification device of any one of claims 1-13, wherein the radial distribution channel has a depth of less than 10 μm .
18. The emulsification device of any one of claims 1-17, wherein the radial nozzle channel is the same depth as the at least one groove.
- 10 19. The emulsification device of any one of claims 1-18, wherein the at least one groove has a 20:1 ratio of length-to-depth.
20. The emulsification device of any one of claims 1-19, wherein the bottom of the inner part is solid.
- 15 21. The emulsification device of claim 20, wherein the bottom of the inner part comprises a cup-shaped protrusion.
22. The emulsification device of any of claims 1-19, wherein the bottom of the inner part comprises a cone-shaped or a cylinder-shaped protrusion.
- 20 23. The emulsification device of any one of claims 1-22, wherein the at least one hole is a slit.
- 25 24. A plurality of the emulsification device of any one of claims 1-23 arranged in an array.
25. The plurality of claim 24, wherein the array is a plate with more than one well.
- 30 26. The plurality of claim 25, wherein the plate has at least 96 wells.