Claims

1. A multilayer container for elevated temperature, high pressure processing of a material within the container, using a pressure transmission liquid within the container, the multilayer container having a container wall comprising an inner layer formed of a plastic for containing the liquid in contact with the inner side thereof and at least one further layer outboard of the inner layer and formed of different plastic from the inner layer, wherein the inner layer has a compression heating coefficient at least as high as the compression heating coefficient of the pressure transmission liquid in contact with the inner side thereof and the at least one further layer has a lower thermal conductivity at ambient pressure and temperature than the inner layer; and wherein the container wall comprises a cylindrical side wall and an end wall sealed on the side wall and wherein the container is provided with a piston having a peripheral edge which seals with the container side wall and is movable within the container side wall in response to a change in pressure applied to the piston externally from the container.

2. A multilayer container according to claim 1, wherein the at least one further layer outboard of the inner layer has a thermal conductivity of no more than 0.33 W m^{-1} K^{-1}), preferably no more than 0.3 W m^{-1} K^{-1}, at 25 °C, more preferably no more than 0.26 W m^{-1} K^{-1}, at 25 °C.

3. A multilayer container according to claim 1 or claim 2 wherein the at least one further layer outboard of the inner layer has a lower compressibility than the inner layer.

4. A multilayer container according to any one of the previous claims, wherein the inner layer has a compression heating coefficient at ambient temperature and pressure of at least 6 x 10^{-11} Pa^{-1} and preferably at least 8 x 10^{-11} Pa^{-1}.

5. A multilayer container according to any one of the previous claims, wherein the compressibility of the at least one layer outboard of the inner layer is no more than 2.5 x 10^{-10} Pa^{-1} and preferably no more than 2 x 10^{-10} Pa^{-1}.

6. A multilayer container according to any one of the previous claims, wherein the at least one layer outboard of the inner layer is formed of at least one plastic selected from the group consisting of polyester, nylon, polycarbonate, natural rubber, synthetic rubber, thermoplastic elastomers, polymethylmethacrylate, chlorinated polyolefins, polyimides and acrylics.

7. A multilayer container according to any one of the previous claims, wherein the inner layer has a coefficient of compression heating at least as high as the pressure transmission liquid and the material to be processed.

8. A multilayer container according to any one of the previous claims, wherein the inner layer is formed of polyethylene, preferably medium or high density polyethylene and most preferably high density polyethylene.

9. A multilayer container according to claim 8, wherein the at least one layer outboard of the inner layer is selected from the group consisting of polypropylene, PTFE, PMMA, PVC, PEEK, PET, PI and PVDF, preferably PMMA and PVDF.

10. A multilayer container according to any one of the previous claims, wherein the at least one further layer comprises an intermediate layer adjacent the inner layer and a further layer outboard of the intermediate layer wherein the intermediate layer has a thermal conductivity, compressibility and coefficient of compression heating lower than that of the inner layer and higher than the at least one layer outboard of the intermediate layer.

11. A multilayer container according to claim 10, wherein the inner layer is formed of HDPE, a further layer is formed of a plastic selected from the group consisting of PTFE, PMMA, PVC, PEEK, PET, PI and PVDF and an intermediate layer is formed of polypropylene or ABS.

12. A multilayer container according to any one of the previous claims, wherein the layers are contiguous.

13. A multilayer container according to any one of the previous claims, wherein each of the inner and further layers are of thickness in the range of from 1mm to 50 mm.

14. A multilayer container according to any one of the previous claims, wherein the material to be processed is a food material and the pressure transmission medium is an aqueous medium.

15. A multilayer container according to any one of the previous claims, wherein there is no heating within the container or from outside of the container.

16. A system for high pressure thermal processing of a material, comprising a container according to any one of the previous claims, a pressure transmission liquid and the material within the container.

17. A system according to claim 16, wherein the container is housed within a pressure chamber for applying high pressure to the pressure transmission liquid.

18. A system according to claim 17, wherein the pressure chamber contains a liquid pressurisation medium separated from the pressure transmission liquid within the container by the piston which seals against the inside of the container and is responsive to pressure exerted by the pressurisation medium to transfer pressure to the pressure transmission liquid.

19. A process for high pressure thermal processing of a material comprising;
    (i) Providing a multilayer container according to any one of claims 1 to 15;
    (ii) Providing a liquid pressure transmission liquid;
    (iii) Preheating the multilayer container, pressure transmission liquid and material;
    (iv) Placing the material to be processed within the container and providing the pressure transmission liquid within the container in association with the material for applying pressure to the material; and
    (v) Applying pressure to the pressure transmission liquid within the container;
    wherein the inner layer provides compression heating to the pressure transmission liquid and the at least one further layer reduces heat loss from the container.

20. A process according to claim 19, wherein the multilayer container, pressure transmission medium and material are preheated to a temperature, yielding a process

temperature (under pressure) in the range of from 40°C to 150°C and the pressure applied is in the range of from 100 to 1000 MPa.

21. A process according to claim 19 or claim 20, wherein the multilayer container, pressure transmission medium and material are preheated to a temperature yielding a process temperature after compression heating in the range of from 50°C to 130°C and the pressure applied is in the range of from 300 MPa to 800 MPa.

22. A process according to any one of claims 19 to 21, wherein the pressure is maintained in the range for a period in the range of from 1 second to 30 minutes.

23. A process according to claim 22, wherein the pressure is maintained in the range for from 30 seconds to 5 minutes.

24. A process according to any one of claims 19 to 23, wherein the temperature of the pressure transmission medium and material is maintained at a temperature of no less than 5°C less than the target/process temperature after pressurisation as a result of compression heating during application of pressure.

25. A process according to any one of claims 19 to 24, wherein the material is a food material and the pressure transmission liquid is an aqueous liquid.