CLAIMS

What is Claimed:

1. A biocontainer, comprising:

a first film, the film having an interior and exterior side;

articulating elements disposed on or within the first film, the articulating elements comprising at least one of a folded hinge, a sealed joint, a thinned pathway, a bowed path, an embedded polymeric or metallic cylindrical fiber or rod; and

a second film, optionally comprising articulating elements, joined to the first film, to form a biocontainer having a closed volume;

wherein the articulating elements permit the biocontainer to expand and collapse along the articulating elements.

2. The biocontainer of claim 1, having at least two walls and an inner volume defined by the at least two walls, the biocontainer being formed of a film material having a first interior side layer formed of one or more layers forming an inner contact zone, one or more layers of a gas impermeable zone and one or more layers of polymers on the exterior side of the of gas impermeable zone forming an outer strength zone and a substrate incorporated into the film between the contact zone and the gas impermeable zone and a substrate formed of a fibrous material.

3. The biocontainer of claim 1 further comprising a substrate formed of a material selected from the group consisting of woven and non-woven fibrous material.

4. The biocontainer of claim 1 wherein the substrate is formed of a material selected from the group consisting of a fibrous material in a form selected from the group consisting of woven and non-woven materials and the fibrous material is made of a material selected from the group consisting of nylon, polyester, aramids, carbon, metal and polyolefins.

5. The biocontainer of any of claims 3-4 wherein the film is formed of a multilayered film having a first interior zone, a gas impermeable zone and a strength zone on the exterior side of the gas impermeable zone forming an outer strength zone and a substrate incorporated into the film between the contact zone and the gas impermeable zone wherein the substrate is formed of a fibrous material.

6. The biocontainer of any of claims 3-5 wherein the substrate has one or more openings formed in it to provide a device selected from the group of a viewing window, one or more ports for adding liquids, powders, processing aids, one or more ports for

monitoring temperature, pH, conductivity, oxygen levels, carbon dioxide levels, foam height and other process variables, one or more ports for removing biological fluids, and/or one or more ports for housing sensors.

7. The biocontainer of any of claims 3-6 wherein the substrate has one or more elongate openings formed in it to provide a viewing window into the interior of the biocontainer.

8. The biocontainer of any of claims 3-7 wherein the substrate is formed of a material selected from the group consisting of polymers, metal fibers, carbon fibers and glass fibers.

9. The biocontainer of any of claims 1-8 further comprising zones of articulation and zones of non-articulation to create articulated joints.

10. The biocontainer of any of claims 1-9 wherein the biocontainers have strength and/or rigidity capable of being a standalone biocontainer.

11. The biocontainer of any of claims 1-10, wherein the biocontainer can maintain an expanded state without the support of a secondary container or of a separate supporting structure, permitting a system having reduced footprint compared with supported systems.

12. The biocontainer of any of claims 1-11, wherein the biocontainer has significantly greater flexural endurance, can be folded or compacted, expanded, folded or compacted, and expanded multiple times without failure.

13. The biocontainer of any of claims 1-12, wherein the biocontainer comprises a 2-dimensional (2D) or a 3-dimensional (3D) biocontainer capable of storing biological fluids.

14. The biocontainer of any of claims 1-13, wherein the biocontainer comprises a plurality of panels of film adhered to form a unitary structure.

15. The biocontainer of any of claims 1-14 wherein a double-jointed articulation produces joints having flexibility in two directions, wherein combining double-jointed articulation with patterns that allow for folding in one direction and locking upon deployment in an opposite direction.

16. The biocontainer of any of claims 1-15, wherein the rigidity of the biocontainers can be further enhanced by constructing stiffer non-articulated zones.

17. The biocontainer of any of claims 1-16, wherein different panels having different thicknesses are used to create articulation joints.

18. The biocontainer of any of claims 1-17, wherein articulations are created by thinning the cross section of the first film.

19. The biocontainer of any of claims 1-18, wherein articulations are created by thickening the cross section of the first film.

20. The biocontainer of any of claims 1-19, wherein articulations are created by thinning and thickening the cross section of the first film.

21. The biocontainer of any of claims 1-20, wherein thinned paths are created by directionally heating one side of the first film but not the other.

22. The biocontainer of any of claims 1-21, wherein thinned paths are created by etching, scoring, ablating the first film.

23. The biocontainer of any of claims 1-22, wherein the bowed path is created by using a member applying heat and pressure to the first film corresponding with a depression on a table or device supporting the first film.

24. The biocontainer of claim 23, wherein the bowed path further comprises additional material adhered thereto.

25. The biocontainer of claim 24, wherein the additional material comprises a polymeric film.

26. The biocontainer of claim 25, wherein the additional material further comprises a thinned path.

27. The biocontainer of any of claims 1-26, further comprising a fluid or gas channel.

28. The biocontainer of claim 27, wherein the fluid or gas is one of oxygen, nitrogen, carbon dioxide, air, or water.

29. The biocontainer of any of claims 1-28, wherein the thinned pathway or bowed path is a discontinuous thinned pathway or bowed path.

30. The biocontainer of any of claims 1-29, wherein the thinned pathway or bowed path is a continuous thinned pathway or bowed path.

31. A biocontainer, comprising:

a first film, the film having an interior and exterior side, wherein the first film forms an inner volume;

one or more articulating elements disposed on or within the first film, the articulating elements comprising at least one of a folded hinge, a sealed joint, a thinned pathway, a bowed path, an embedded polymeric or metallic cylindrical fiber or rod, wherein the first film forms an inner volume; and

a second film, releasably adhered to the inner volume of the first film to form an outer biocontainer having a removable contact layer film,

wherein the articulating elements permit the biocontainer to expand and collapse along the articulating elements.

32. The biocontainer of claim 31, wherein the removable contact film layer permits the outer biocontainer to be re-used for separate bioprocessing processes.

33. The biocontainer of either of claims 31-32, comprising a plurality of removable contact film layers.

34. The biocontainer of any of claims 31-33, wherein the second film comprises articulations.

35. A biocontainer, comprising:

a first film, the film having an interior and exterior side, forming an inner volume; and

a second film, releasably adhered to the inner volume of the first film to form an outer biocontainer having a removable contact layer film, wherein the removable contact film layer permits the outer biocontainer to be re-used for separate bioprocessing processes.

36. The biocontainer of claim 35, wherein the second film comprises articulations.

37. The biocontainer of either of claims 35-36, wherein one or more articulating elements are disposed on or within the first film, the articulating elements comprising at least one of a folded hinge, a sealed joint, a thinned pathway, a bowed path, an embedded polymeric or metallic cylindrical fiber or rod, wherein the first film forms an inner volume.

38. The biocontainer of any of claims 35-37, comprising a plurality of peelable contact film layers.

39. The biocontainer of any of claims 35-38, wherein the second film comprises articulations.

40. A biocontainer system, comprising:

a first outer container; and

a first inner bag disposed within the first outer container.

41. The biocontainer system of claim 40, wherein the first inner bag is compacted and comprises articulations.

42. The biocontainer system of either of claims 40-41, wherein the first inner bag is capable of being compacted, disposed within and removed from the first outer container.

43. The biocontainer system of any of claims 40-42, wherein the first outer container is a flexible container comprising polymeric films.

44. The biocontainer system of claim 43, wherein the polymeric films of the first outer container comprise articulations.

45. The biocontainer system of any of claims 40-44, wherein the first outer container comprises tabs for housing a support system.

46. The biocontainer system of claim 45, wherein the support system is a scissor scaffolding system or a plurality of poles.

47. A method for forming folds, rigid channels, weaker channels, and/or joints within flexible films, comprising:

steps for applying vacuum forming, embossing, folding and pressing, 3D printing, and/or ablating processes to the flexible film.

48. The method of claim 47, wherein the method for forming includes a system having an inductive heating tip on a Gantry apparatus, roller balls and/or rotary wheels for producing a film having one or more folds, the folds having a folded angle, the folded angle of the film comprising an angle of 20-160°.

49. A biocontainer capable of being expanded and compacted, comprising:

a plurality of films having tessellations, wherein the plurality of films are joined together to form a container having an inner volume capable of holding a fluid; and

wherein the joined films form planes.

50. The biocontainer of claim 49, wherein the biocontainer comprises four, six, eight, or ten planes.

51. The biocontainer of either of claims 49-50, wherein the biocontainer comprises equal and unequal planes.