

CLAIMS

1. A bioreactor vessel (1) having an outer vessel wall (2) and a bottom (3), further comprising at least one integrated internal structure (4) providing at least two additional surfaces (4a), (4b) to the inner reactor space of said vessel, said internal structure (4) being spaced apart from said outer vessel wall (2).
2. The bioreactor vessel of claim 1, wherein said internal structure (4) comprises a wall providing an outer surface (4a) and an inner surface (4b), wherein said wall (i) has at least one opening (5) at least in the area closest to the bottom (3), or (ii) is spaced apart from the bottom (3), or (iii) has opening(s) and is spaced apart from the bottom (3).
3. The bioreactor vessel of claim 1 or 2, wherein said opening(s) (5) and/or the space from the bottom (3) have/has a dimension of at least 0,05 mm in any direction, preferably in the range of from 0,1 mm to 10 cm, dependent from the total dimension of the bioreactor vessel.
4. The bioreactor vessel of any of the preceding claims, wherein said opening(s) (5) can have any shape selected from circular, half-circular, representing a circle sector, elliptic, half-elliptic, representing an oval sector, triangular, rectangular, polygonal, undulated or any combination thereof.
5. The bioreactor vessel of any of the preceding claims, wherein said opening(s) (5) is / are located at least at the lower end of the internal structure (4) contacting the bottom (3) of the vessel, wherein preferably said opening(s) (5) have such a dimension leaving at least 80 % of the contact area between the lower end of internal structure (4) and bottom (3), preferably at least 85 %, more preferred at least 90 %, at least 95 % and up to 97 % or even up to 98 % of the theoretical possible contact area between the internal structure lower end and the bottom (3).
6. The bioreactor vessel of any of the preceding claims, wherein said outer vessel wall (2) and said internal structure (4) have basically the same or a different geometrical shape, preferably independently selected from a cylindrical, conical or elliptic shape, most preferred both have a cylindrical shape.
7. The bioreactor vessel of any of the preceding claims, comprising more than one internal structure (4), so that more than two, preferably at least 4, at least 6 or at least 8 additional surfaces are provided within the vessel (1).

8. The bioreactor vessel of any of the preceding claims, wherein the outer surface (4a) of the internal structure (4) is spaced apart from the inner surface (2b) of the vessel wall (2) by at least $1/15$, or by at least $1/12$, or by at least $1/10$, of the cross section of the total reactor chamber, but preferably not more than $1/3$, more preferred not more than $1/4$. even more preferred not more than $1/5$ or not more $1/8$ of the cross-section of the total inner space.
9. The bioreactor vessel of any of the preceding claims, wherein the outer surface (4a) of said internal structure (4) is spaced apart from the inner surface (2b) of the outer vessel wall (2) in a distance so that the ratio of the cross section of the internal structure (CS_{in}) to the cross section of the outer vessel wall (CS_{out}) is in the range from 0,95 to 0,4, preferably in the range of from 0,92 to 0,5, more preferred in the range between 0,9 and 0,55 and most preferred in the range of from 0,85 to 0,6,, wherein said cross sections are measured along the bottom (3) in the space between the inner surfaces (2b) and (4b), respectively.
10. The bioreactor vessel of claim 7, wherein each of the internal structures (4) are spaced apart from each other or have a ratio of cross sections CS_{in} to CS_{out} to each other as defined in claims 8 and 9 for the outer vessel wall (2) and the internal structure (4).
11. The bioreactor vessel of any of the preceding claims, said bioreactor is a single reactor in form of a container, a flask, a bottle, a pipe, a tube, a cup or a bag, or is part of a multiarray with a plurality of individual vessels.
12. The bioreactor vessel of any of the preceding claims further comprising a cover (6).
13. The bioreactor vessel of any of the preceding claims further comprising an inlet and/or an outlet, allowing the addition or withdrawal of any content of the vessel or the placement of any measuring device inside of the vessel.
14. Use of a bioreactor vessel as defined in any of the preceding claims for the growing of biological cells, preferably biological cells growing under aerobic conditions, in particular microorganisms selected from bacteria, fungi, yeast, algae or archaee, or animal cells, human cells or plant cells.
15. Process for growing biological cells under defined gas conditions, wherein a bioreactor vessel (1) as defined in any of the preceding claims is provided with cells for growing and at least partially filled with a liquid and is shaken so that at least the liquid is rotationally moved inside the vessel.