CLAIMS

1. A centrifugal separation system (200) comprising a centrifugal separator (202), a liquid feed mixture conduit (204), a light phase conduit (206), a heavy phase conduit (208), and a flow control system (210), wherein

the centrifugal separator (202) comprises a rotor (212) configured to rotate about an axis (20) of rotation and being provided with a separation space (88), a stack (90) of separation discs (92) arranged inside the separation space (88), a first stationary portion (84) arranged at a first axial end (22) of the rotor (212), a second stationary portion (86) arranged at the second axial end (24) of the rotor (212), wherein

an inlet passage (214) extends into the separation space (88) via the first or second stationary portion (84, 86), a light phase outlet passage (216) extends from the separation space (88) via the first or second stationary portion (84, 86), a heavy phase outlet passage (218) extends from the separation space (88) via the first or second stationary portion (84, 86), wherein

the heavy phase outlet passage (218) comprises at least one channel (102) extending within the rotor (212) from a radially outer portion of the separation space (88) towards a central portion of the rotor (212), wherein

each of the inlet passage (214), the light phase outlet passage (216), and the heavy phase outlet passage (218) is mechanically hermetically sealed between the rotor (212) and respective of the first and second stationary portions (84, 86), wherein

the inlet passage (214) enters the rotor (212) centrally on the axis (20) of rotation at R0, the heavy phase outlet passage (218) exits the rotor (212) at a first radius R1, and the light phase outlet passage exits the rotor (212) at a second radius R2, wherein $R2 \geq R1 \geq R0$ and $R2 > R0$, wherein

the flow control system (210) comprises a control unit (226), a flow control valve (224) arranged in the light phase conduit (206), a liquid feed mixture measuring device (220), and a light phase measuring device (222) and/or a heavy phase measuring device (223), and wherein

the control unit (226) is configured to control the flow control valve (224) based on measurements from the liquid feed mixture measuring device (220) and measurements from the light phase measuring device (222) and/or the heavy phase measuring device (223) and

wherein the heavy phase conduit (208) is configured to extend to a heavy phase receiving container (232), and wherein

the heavy phase conduit (208) forms an unrestricted passage from the centrifugal separator (202) to the heavy phase receiving container (232) when a flow of heavy phase exists from the heavy phase outlet passage (218) to the heavy phase receiving container (232).

2. The centrifugal separation system (200) according to claim 1, wherein the liquid feed mixture conduit (204) is configured to be connected to a source of pressurised liquid feed mixture (228).

3. The centrifugal separation system (200) according to claim 1 or 2, comprising a feed pump (230) arranged in the liquid feed mixture conduit (204).

4. The centrifugal separation system (200) according to claim 1 or 2, comprising a liquid feed mixture container (236) and means (238) for controlling a pressure within the liquid feed mixture container (236).

~~5. The centrifugal separation system (200) according to any one of the preceding claims, wherein the heavy phase conduit (208) is configured to extend to a heavy phase receiving container (232), and wherein~~

~~the heavy phase conduit (208) forms an unrestricted passage from the centrifugal separator (202) to the heavy phase receiving container (232) when a flow of heavy phase exists from the heavy phase outlet passage (218) to the heavy phase receiving container (232).~~

~~6~~5. The centrifugal separation system (200) according to any one of the preceding claims, comprising a shut-off valve (234) arranged in the heavy phase conduit (208).

~~7~~6. The centrifugal separation system (200) according to any one of the preceding claims, wherein the centrifugal separator (202) comprises an exchangeable separation insert (6), wherein

the exchangeable insert (6) comprises a rotor casing (82), and the first and second stationary portions (84, 86) arranged at respective axial ends (120, 122) of the rotor casing (82), wherein the rotor casing (82) forms part of the rotor (212) of the centrifugal separator (202) and comprises the separation space (88), the separation discs (92), and the at least one channel (102).

~~8~~7. The centrifugal separation system (200) according to claim ~~7~~6, wherein the rotor (212) comprises a rotatable member (16) and the rotor casing (82), and wherein the rotor casing (82) is engaged in an inner space (26) of the rotatable member (16).

~~9~~8. The centrifugal separation system (200) according to any one of the preceding claims, comprising a liquid feed mixture container (236), wherein a stirring member (237) is arranged within the liquid feed mixture container (236).

~~10~~9. The centrifugal separation system (200) according to any one of the preceding claims, wherein the measurements from the liquid feed measuring device (220) relate to a flow of liquid feed mixture, the measurements from the light phase measuring device (222) and/or the heavy phase measuring device (223) relate to a flow of light phase and/or a flow of heavy phase, wherein the control unit (226) is configured to control the flow control valve (224) towards a desired relationship between the flow of liquid feed mixture and the flow of light phase and/or the flow of heavy phase.

~~11~~10. The centrifugal separation system (200) according to claim ~~10~~9, wherein the flow of liquid feed mixture and the flow of light phase and/or the flow of heavy phase are volume flows.

~~12~~11. The centrifugal separation system (200) according to claim ~~10~~9, wherein the flow of liquid feed mixture and the flow of light phase and/or the flow of heavy phase are mass flows.

~~13~~12. The centrifugal separation system (200) according to any one of claims 1 - ~~11~~10, wherein the liquid feed mixture measuring device (220) is a volume flow meter.

~~14~~13. The centrifugal separation system (200) according to any one of the claims 1 – ~~10~~ 9 or 12, wherein the liquid feed mixture measuring device (220) is a mass flow meter.

~~15~~14. The centrifugal separation system (200) according to claim ~~13~~12, comprising a mass flow meter (244) arranged in the liquid feed mixture conduit (204).

~~16~~15. A method (300) of controlling a centrifugal separation system (200), the centrifugal separation system (200) comprising a centrifugal separator (202), a liquid feed mixture conduit (204), a light phase conduit (206), a heavy phase conduit (208), and a flow control system (210), wherein

the centrifugal separator (202) comprises a rotor (212) configured to rotate about an axis (20) of rotation and being provided with a separation space (88), a stack (90) of separation discs (92) arranged inside the separation space (88), a first stationary portion (84) arranged at a first axial end (22) of the rotor (212), a second stationary portion (86) arranged at the second axial end (24) of the rotor (212), wherein

an inlet passage (214) extends into the separation space (88) via the first or second stationary portion (84, 86), a light phase outlet passage (216) extends from the separation space (88) via the first or second stationary portion (84, 86), a heavy phase outlet passage (218) extends from the separation space (88) via the first or second stationary portion (84, 86), wherein

the heavy phase outlet passage (218) comprises at least one channel (102) extending within the rotor (212) from a radially outer portion of the separation space (88) towards a central portion of the rotor (212), wherein

each of the inlet passage (214), the light phase outlet passage (216), and the heavy phase outlet passage (218) is mechanically hermetically sealed between the rotor (212) and respective of the first and second stationary portions (84, 86), wherein

the inlet passage (214) enters the rotor (212) centrally on the axis (20) of rotation at R0, the heavy phase outlet passage (218) exits the rotor (212) at a first radius R1, and the light phase outlet passage exits the rotor (212) at a second radius R2, wherein $R2 \geq R1 \geq R0$ and $R2 > R0$, wherein

the flow control system (210) comprises a flow control valve (224) arranged in the light phase conduit (206), a liquid feed mixture measuring device (220), and a light phase measuring device (222) and/or a heavy phase measuring device (223), and wherein

the method (300) comprises steps of:

- rotating (302) the rotor (212),
- conducting (304) a flow of liquid feed mixture into the separation space (88) via the liquid feed mixture conduit (204) and the inlet passage (214),
- separating (306) the liquid feed mixture into a heavy phase and a light phase in the separation space (88),
- measuring (308) the flow of liquid feed mixture,
- measuring (310) a flow of light phase and/or a flow of heavy phase, and
- controlling (312) the flow control valve (224) based on measurements acquired in the step of measuring (308) the flow of liquid feed mixture and measurements acquired in the step of measuring (310) the flow of light phase and/or the flow of heavy phase.

~~17~~16. The method (300) according to claim ~~16~~15, comprising a step of:

- controlling (313) a pressure of the liquid feed mixture.

~~18~~17. The method (300) according to claim ~~17~~16, wherein the step of controlling (313) the pressure of the liquid feed mixture comprises a step of:

- controlling (314) a feed pump (230) arranged in the liquid feed mixture conduit (204).

~~19~~18. The method (300) according to claim ~~17~~16, wherein the centrifugal separation system (200) comprises a liquid feed mixture container (236), and wherein the step of controlling (312) the pressure of the liquid feed mixture comprises a step of:

- controlling (318) a pressure within the liquid feed mixture container (236).

~~20~~19. The method (300) according to any one of claims ~~16~~ 15 - ~~19~~18, wherein the centrifugal separation system (200) comprises a shut-off valve (234) arranged in the heavy phase conduit (208), and wherein the method (300) comprises steps of:

- maintaining (320) the shut-off valve (234) closed during an initial separation phase of separating a batch of liquid feed mixture while an interface between the light phase and heavy phase forms within the separation space (88), and

- maintaining (322) the shut-off valve (234) fully open during a main separation phase of separating the batch of liquid feed mixture when the interface has formed.

~~21~~20. The method (300) according to any one of claims ~~16~~ 15 - ~~20~~19, wherein the step of conducting (304) the flow of liquid feed mixture into the separation space (88) comprises a step of:

- conducting (324) a flow of liquid feed mixture comprising a cell culture mixture into the separation space (88).

~~22~~21. The method (300) according to any one of claims ~~16~~ 15 - ~~21~~20, wherein the step of controlling (312) the flow control valve (224) comprises a step of:

- controlling (326) the flow control valve (224) towards a desired relationship between the flow of liquid feed mixture and the flow of light phase and/or the flow of heavy phase.