Patent claims

1. A method for thermal separation of a volatile substance from a non- or less volatile substrate with a phase boundary in relation to a gas space that receives the volatile substance after vaporization and/or sublimation, the volatile substance being vaporized in the mass of the substrate and bubbles being transported to the surface or phase boundary and mechanical energy being supplied to the surface or phase boundary for effectively destroying the bubbles at the surface.

2. The method as claimed in claim 1, characterized in that a volatile or partly volatile additive is incorporated in the substrate and bubbles produced from the vaporizable component in the substrate are destroyed.

3. The method as claimed in claim 2, characterized in that the rate at which the additive is added is at least 0.1 kg/h per kg of viscous mass of the substrate per hour.

4. The method as claimed in claim 2 or 3, characterized in that, as a result of being subjected to mechanical action, the bubbles produced, with the additive and the volatile substance, reach the surface of the substrate.

5. The method as claimed in one of claims 2 - 4, characterized in that a boiling point of the additive lies at least 10 K, at most 100 K, below the temperature of the substrate.

6. The method as claimed in one of claims 2 - 5, characterized in that the volatile or partly volatile additive

is applied to the phase boundary from the substrate to the gas space, which supplies mechanical energy to the phase boundary in the form of cavitation energy, in particular by the vaporization or sublimation.

7. The method as claimed in one of claims 2 - 6, characterized in that the additive is water.

8. The method as claimed in one of claims 1 - 7, characterized in that the supply of mechanical energy takes place approximately uniformly over the entire phase boundary from the substrate to the gas space.

9. The method as claimed in one of claims 2 - 8, characterized in that the additive is metered onto a rotating shaft, on which the substrate is located, the rotation of the shaft providing a uniform distribution of the additive over the circumference of the rotation.

10. The method as claimed in one of claims 2 - 9, characterized in that the additive is metered onto the phase boundary within a rotating hollow body, on which the substrate is located, the rotation of the shaft providing the uniform distribution of the additive over the circumference of the rotation.

11. The method as claimed in one of claims 2 to 10, characterized in that the additive is fed in under atmospheric pressure in the gas space.

12. The method as claimed in claim 1, characterized in that sound waves that supply mechanical energy to the phase boundary are applied to the phase boundary from the substrate to the gas

space.

13. The method as claimed in claim 12, characterized in that a transmitter of the sound waves is directed at the surface of a rotating shaft on which the substrate is located, the rotation of the shaft providing the uniform distribution of the sound waves over the circumference of the rotation.

14. The method as claimed in claim 12, characterized in that a transmitter of the sound waves is directed at the surface within a rotating hollow body on which the substrate is located, the rotation of the shaft providing the uniform distribution of the sound waves over the circumference of the rotation.

15. An apparatus for carrying out the method as claimed in one of claims 1 - 14, characterized in that a substrate space and a gas space are formed by a mixing kneader with at least one horizontally arranged shaft, on which kneading elements are located, the gas space and/or the substrate space being assigned devices for introducing at least one volatile or partly volatile additive.

16. The apparatus as claimed in claim 15, characterized in that the devices are distributed uniformly over the gas space and/or the substrate space.

17. The apparatus as claimed in claim 15 or 16, characterized in that the devices are spray nozzles.

Patent claims

1. A method for thermal separation of a volatile substance from a non- or less volatile substrate with a phase boundary in relation to a gas space that receives the volatile substance after vaporization and/or sublimation, the volatile substance being vaporized in the mass of the substrate and bubbles being transported to the surface or phase boundary and mechanical energy being supplied to the surface or phase boundary for effectively destroying the bubbles at the surface, characterized in that sound waves that supply mechanical energy to the phase boundary are applied to the phase boundary from the substrate to the gas space.

2. The method as claimed in claim 1, characterized in that a volatile or partly volatile additive is incorporated in the substrate and bubbles produced from the vaporizable component of the additive in the substrate are destroyed.

3. The method as claimed in claim 2, characterized in that the rate at which the additive is added is at least 0.1 kg/h per kg of viscous mass of the substrate per hour.

4. The method as claimed in claim 2 or 3, characterized in that, as a result of being subjected to mechanical action, the bubbles produced, with the additive and the volatile substance, reach the surface of the substrate.

5. The method as claimed in one of claims 2 - 4, characterized in that a boiling point of the additive lies at least 10 K, at most 100 K, below the temperature of the

substrate.

6. The method as claimed in one of claims 2 - 5, characterized in that the volatile or partly volatile additive is applied to the phase boundary from the substrate to the gas space, which supplies mechanical energy to the phase boundary in the form of cavitation energy, in particular by the vaporization or sublimation.

7. The method as claimed in one of claims 2 - 6, characterized in that the additive is water.

8. The method as claimed in one of claims 1 - 7, characterized in that the supply of mechanical energy takes place approximately uniformly over the entire phase boundary from the substrate to the gas space.

9. The method as claimed in one of claims 2 - 8, characterized in that the additive is metered onto a rotating shaft, on which the substrate is located, the rotation of the shaft providing a uniform distribution of the additive over the circumference of the rotation.

10. The method as claimed in one of claims 2 - 9, characterized in that the additive is metered onto the phase boundary within a rotating hollow body, on which the substrate is located, the rotation of the shaft providing the uniform distribution of the additive over the circumference of the rotation.

11. The method as claimed in one of claims 2 to 10, characterized in that the additive is fed in under atmospheric pressure in the gas space.

12. The method as claimed in claim 1, characterized in that a transmitter of the sound waves is directed at the surface of a rotating shaft on which the substrate is located, the rotation of the shaft providing the uniform distribution of the sound waves over the circumference of the rotation.

13. The method as claimed in claim 1, characterized in that a transmitter of the sound waves is directed at the surface within a rotating hollow body on which the substrate is located, the rotation of the shaft providing the uniform distribution of the sound waves over the circumference of the rotation.

14. An apparatus for carrying out the method as claimed in one of claims 1 - 13, characterized in that a substrate space and a gas space are formed by a mixing kneader with at least one horizontally arranged shaft, on which kneading elements are located, the gas space and/or the substrate space being assigned devices for introducing at least one volatile or partly volatile additive.

15. The apparatus as claimed in claim 14, characterized in that the devices are distributed uniformly over the gas space and/or the substrate space.

16. The apparatus as claimed in claim 14 or 15, characterized in that the devices are spray nozzles.