liquid leakage from a pipette due to volatilization of volatile liquid.

SOLUTIONS TO THE PROBLEMS

[0011]

A processing method according to the present disclosure is a processing method for a volatile liquid using a pipette including a cylinder, a piston that slides in the cylinder, and a tip attached to a tip end of the cylinder, the tip including a suction/ejection port, the pipette performing suction and ejection of a liquid through the suction/ejection port of the tip in accordance with movement of the piston. The processing method includes the following steps:

a low-volatility liquid suction step of sucking a low-volatility liquid that is less volatile than the volatile liquid through the suction/ejection port;

an air suction step of sucking air through the suction/ejection port after the low-volatility liquid suction step; and

a volatile liquid suction step of sucking the volatile liquid through the suction/ejection port after the air suction step.

[0011a]

In an aspect, there is provided a processing method for a volatile liquid ~~to be sucked~~ using a pipette including a cylinder,

a piston that slides in the cylinder, and a tip attached to a tip end of the cylinder, the tip including a suction/ejection port, the pipette ~~performing~~ being configured to perform suction of a liquid into the tip by increasing an air filling the cylinder in accordance with movement of the piston and to perform ejection of ~~a~~the liquid ~~through the suction/ejection port of the tip~~from the tip by reducing the air filling the cylinder in accordance with movement of the piston,

~~wherein~~ the processing method ~~comprises different orders of steps according to whether the liquid to be sucked is a volatile liquid or not,~~

~~in a case where the liquid to be sucked is a volatile liquid, the following steps are performed~~comprising:

a low-volatility liquid suction step of sucking a low-volatility liquid that is less volatile than the volatile liquid ~~to be sucked~~ into the tip through the suction/ejection port;

an air suction step of sucking air into the tip through the suction/ejection port after the low-volatility liquid suction step; and

a volatile liquid suction step of sucking the volatile liquid ~~to be sucked~~into the tip through the suction/ejection port after the air suction step,

~~in a case where the liquid to be sucked is not the volatile liquid, the liquid suction step is performed without the low-volatility liquid suction step and the air suction step,~~

[0012a]

In another aspect, there is provided a liquid processing apparatus comprising:

a pipette including a vertically positioned cylinder, a piston that slides in a vertical direction in the cylinder, and a tip, the tip being attached to a lower end of the cylinder in such a way that an suction/ejection port provided at a tip end of the tip faces downward, the ~~pipette performing suction and ejection of a liquid through the suction/ejection port of the tip in accordance with movement of the piston~~being configured to perform suction of a liquid into the tip by increasing an air filling the cylinder in accordance with movement of the piston and to perform ejection of the liquid from the tip by reducing the air filling the cylinder in accordance with movement of the piston;

a driving mechanism that causes the pipette to operate;

a volatile liquid container accommodating a volatile liquid~~ to be sucked~~;

a low-volatility liquid container accommodating a low-volatility liquid; and

a control part that controls the driving mechanism,

wherein the control part is configured to control the driving mechanism in such a way that~~, in a case where the liquid to be sucked is a volatile liquid~~, a low-volatility liquid suction operation of sucking a preset amount of the low-volatility liquid from the low-volatility liquid container

is performed, ~~and~~ an air suction operation of sucking a preset amount of air through the suction/ejection port is performed after the low-volatility liquid suction operation ~~are performed before~~, and a volatile liquid suction operation of sucking a predetermined amount of the volatile liquid ~~to be sucked~~ from the liquid container is performed after the air suction operation,

~~wherein the control part is configured to control the driving mechanism in such a way that, in a case where the liquid to be sucked is not a volatile liquid, the liquid suction operation is performed without the low-volatility liquid suction operation and the air suction operation,~~

wherein the low-volatility liquid is a substance that has a boiling point of 95°C or higher and is in a liquid state at normal temperature, and

wherein the volatile liquid is a substance that has a boiling point in the range of 50 to 95°C and is in a liquid state at normal temperature, or is a liquid that contains 10% or more of the substance.

[0013]

CLAIMS

1. A processing method for a volatile liquid ~~to be sucked~~ using a pipette including a cylinder, a piston that slides in the cylinder, and a tip attached to a tip end of the cylinder, the tip including a suction/ejection port, the pipette ~~performing~~ being configured to perform suction of a liquid into the tip by increasing an air filling the cylinder in accordance with movement of the piston and to perform ejection of ~~a~~the liquid ~~through the suction/ejection port of the tip~~from the tip by reducing the air filling the cylinder in accordance with movement of the piston,

~~wherein~~ the processing method ~~comprises different orders of steps according to whether the liquid to be sucked is a volatile liquid or not,~~

~~in a case where the liquid to be sucked is a volatile liquid, the following steps are performed~~comprising:

a low-volatility liquid suction step of sucking a low-volatility liquid that is less volatile than the volatile liquid ~~to be sucked~~ into the tip through the suction/ejection port;

an air suction step of sucking air into the tip through the suction/ejection port after the low-volatility liquid suction step; and

a volatile liquid suction step of sucking the volatile liquid ~~to be sucked~~ into the tip through the suction/ejection

port after the air suction step,

~~in a case where the liquid to be sucked is not the volatile liquid, the liquid suction step is performed without the low-volatility liquid suction step and the air suction step,~~

wherein the low-volatility liquid is a substance that has a boiling point of 95°C or higher and is in a liquid state at normal temperature, and

wherein the volatile liquid is a substance that has a boiling point in the range of 50 to 95°C and is in a liquid state at normal temperature, or is a liquid that contains 10% or more of the substance.

2. The processing method according to claim 1, wherein the processing method further comprises, before the air suction step, a determining step of determining the amount of air sucked through the suction/ejection port in the air suction step in accordance with the volatility of the volatile liquid ~~to be sucked~~ and the sucking amount of the volatile liquid ~~to be sucked~~ in the volatile liquid suction step.

3. The processing method according to claim 1 or 2, wherein the low-volatility liquid is any one of water, dimethyl sulfoxide, glycerol, and phenol.

4. The processing method according to any one of claims 1

to 3, wherein the volatile liquid is any one of acetonitrile, methanol, ethanol, acetone, toluene, isopropanol, hexane, butanol, cyclohexane, ethylene glycol, benzene, chloroform, acetaldehyde, triethylamine, phenol, naphthalene, formaldehyde, tetrahydrofuran, and ethyl acetate, or a liquid containing 10% or more of these.

5. A liquid processing apparatus comprising:

a pipette including a vertically positioned cylinder, a piston that slides in a vertical direction in the cylinder, and a tip, the tip being attached to a lower end of the cylinder in such a way that an suction/ejection port provided at a tip end of the tip faces downward, the pipette ~~performing suction and ejection of a liquid through the suction/ejection port of the tip in accordance with movement of the piston~~ being configured to perform suction of a liquid into the tip by increasing an air filling the cylinder in accordance with movement of the piston and to perform ejection of the liquid from the tip by reducing the air filling the cylinder in accordance with movement of the piston;

a driving mechanism that causes the pipette to operate;

a volatile liquid container accommodating a volatile liquid ~~to be sucked~~;

a low-volatility liquid container accommodating a low-volatility liquid; and

a control part that controls the driving mechanism,

wherein the control part is configured to control the driving mechanism in such a way that~~, in a case where the liquid to be sucked is a volatile liquid~~, a low-volatility liquid suction operation of sucking a preset amount of the low-volatility liquid from the low-volatility liquid container is performed, ~~and~~ an air suction operation of sucking a preset amount of air through the suction/ejection port is performed after the low-volatility liquid suction operation ~~are performed before~~, and a volatile liquid suction operation of sucking a predetermined amount of the volatile liquid ~~to be sucked~~ from the liquid container is performed after the air suction operation,

~~wherein the control part is configured to control the driving mechanism in such a way that, in a case where the liquid to be sucked is not a volatile liquid, the liquid suction operation is performed without the low volatility liquid suction operation and the air suction operation,~~

wherein the low-volatility liquid is a substance that has a boiling point of 95°C or higher and is in a liquid state at normal temperature, and

wherein the volatile liquid is a substance that has a boiling point in the range of 50 to 95°C and is in a liquid state at normal temperature, or is a liquid that contains 10% or more of the substance.

6. The liquid processing apparatus according to claim 5, wherein the sucking amount of air of the air suction operation is determined in accordance with the volatility of the volatile liquid ~~to be sucked~~ and the sucking amount of the volatile liquid ~~to be sucked~~ of the volatile liquid suction operation.

~~7. The liquid processing apparatus according to claim 5 or 6, wherein the control part stores a list of volatile liquids, and is configured to determine whether the liquid to be sucked is a volatile liquid based on the list.~~

~~8~~7. The liquid processing apparatus according to ~~any one of~~ claim~~s~~ 5 ~~to~~or ~~7~~6, wherein the low-volatility liquid is any one of water, dimethyl sulfoxide, glycerol, and phenol.

~~9~~8. The liquid processing apparatus according to any one of claims 5 to ~~8~~7, wherein the volatile liquid is any one of acetonitrile, methanol, ethanol, acetone, toluene, isopropanol, hexane, butanol, cyclohexane, ethylene glycol, benzene, chloroform, acetaldehyde, triethylamine, phenol, naphthalene, formaldehyde, tetrahydrofuran, and ethyl acetate, or a liquid containing 10% or more of these.