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Smart infusion system, device, and method

Abstract

A home appliance is provided for substance processing using microwave. The home appliance includes a temperature sensor, a microwave generator configured to generate microwave, and a controller coupled to the temperature sensor and the microwave generator. The controller is configured to control an operation of the microwave generator based on a measurement of the temperature sensor for processing the substance.

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Background/Summary

CROSS-REFERENCE OF RELATED APPLICATIONS (1) The application is a continuation of U.S. application Ser. No. 18/779,556, filed on Jul. 22, 2024, which claims foreign priorities to Chinese Application No. 202410373051.2, filed on Mar. 29, 2024, Chinese Application No. 202421003123.6, filed on May 9, 2024, and Chinese Application No. 202420998073.3, filed on May 9, 2024. All of the aforementioned applications are hereby incorporated by reference in their entireties.

FIELD
(1) The present disclosure relates to an electronic system/device, and more particularly, for drying, extracting, or transforming materials.
BACKGROUND
(2) Current household herbal extractors commonly use electric heating. Generally, household herbal extractors heat the container to the desired temperature and maintain the temperature of the container for an extended period to facilitate the extraction process. Plant components submerged in the medium gradually release their extracts into the solution. However, conventional methods are

time-consuming, often taking in excess of two hours, and are not efficient for quickly extracting high concentrations of plant components.

(3) Due to the limitations in existing technologies, there is a need for developing techniques for more efficient extraction or similar applications suitable for household use scenarios.

SUMMARY

(4) A first aspect of the present disclosure provides a home appliance for substance processing using microwave comprising: a temperature sensor; a microwave generator configured to generate microwave; and a controller coupled to the temperature sensor and the microwave generator and configured to control an operation of the microwave generator based on a measurement of the temperature sensor for processing the substance,

(5) In an embodiment, the home appliance further comprises a weighing sensor coupled to the controller, wherein the controller is further configured to control an operation of the microwave generator based on a measurement of the weighing sensor for processing the substance.

(6) In an embodiment, the home appliance further comprises a motor coupled to the controller and configured to drive a rotor placed inside the substance, wherein the controller is further configured to adjust, based on at least one of the measurement of the weighing sensor and the measurement of the temperature sensor, a rotational speed of the rotor through the motor.

(7) In an embodiment, the home appliance further comprises: a main body providing a chamber with a side opening, wherein the microwave generator is situated beneath the chamber, and the substance is placed inside the chamber during process; a door fixed on a first side frame of the main body, wherein the door can be closed to cover the side opening of the chamber in the main body; a waveguide integrated in a rear frame of the main body, the waveguide being connected to the microwave generator and configured to direct the microwaves into the chamber through an output port located at a rear surface of the chamber; and a weighing sensor integrated in the main body, wherein the temperature sensor is removably attachable to a first side surface of the chamber, and the first side surface of the chamber is an interior surface of the first side frame of the main body, and wherein the controller is integrated in the main body and configured to: obtain measurements from the weighing sensor and the temperature sensor; and adjust, based on the measurements, the operation of the microwave generator.

(8) In an embodiment, the home appliance further comprises: a motor situated beneath the chamber and proximate to a bottom surface of the chamber, wherein the motor is configured to drive a rotor when the rotor is placed inside the chamber, and wherein the controller is further configured to adjust, based on the measurements, a rotational speed of the rotor through the motor.

(9) In an embodiment, the home appliance further comprises: one or more cooling fans adjacent to the microwave generator and configured to dissipate heat from the microwave generator.

(10) In an embodiment, the home appliance further comprises: a two-step door locking mechanism integrated in a second side frame of the main body, wherein the second side frame and the first side frame are on opposite sides of the main body.

(11) In an embodiment, wherein the weighing sensor is integrated in a top frame of the main body.

(12) In an embodiment, wherein the controller further comprises: one or more processors; a memory storing instructions executable by the one or more processors; and a transceiver configured to receive parameter models associated with one or more recipes, wherein the memory is configured to store the parameter models associated with one or more recipes, and wherein the one or more processors are configured to: determine, for the substance, a set of parameters corresponding to a parameter model associated with a recipe of the one or more recipes; and determine, based on the measurements, an adjustment to one or more parameters in the set of parameters for processing the substance.

(13) In an embodiment, wherein the main body comprises an opening in a top frame, the opening serves as a channel, allowing air communication between inside and outside the chamber, and wherein the opening does not allow the microwaves to pass through.

(14) In an embodiment, the home appliance further comprises: a condenser connected to the main body through the opening, wherein the condenser is configured to collect steam from the chamber.
(15) In an embodiment, the home appliance for substance processing using microwave comprises: a main body providing a chamber with a side opening; a door fixed on a first side frame of the main body, wherein the door can be closed to cover the side opening of the chamber in the main body; a microwave generator situated beneath the chamber and configured to generate microwaves for heating the substance placed in the chamber; a waveguide integrated in a rear frame of the main body, the waveguide being connected to the microwave generator and configured to direct the microwaves into the chamber through an output port located at a rear surface of the chamber; a weighing sensor integrated in the main body; one or more temperature sensors removably attached to a first side surface of the chamber; and a control circuitry integrated in the main body and configured to: obtain measurements from the weighing sensor and the one or more temperature sensors connected to the chamber; and adjust, based on the measurements, operations of the microwave generator.
(16) A second aspect of the present disclosure provides a method for processing substance using a home appliance, comprising: generating microwave, using a microwave generator, to heat a substance disposed within the home appliance; receiving a temperature measurement from a temperature sensor disposed within the home appliance; and controlling an operation of the microwave generator based in part on the temperature measurement.
(17) In an embodiment, the method further comprises: determining, based on a selected mode of the home appliance, a set of parameters for controlling the operation of the microwave generator; receiving a weight measurement from a weighing sensor disposed within the home appliance; adjusting, based on the weight measurement, one or more parameters of the set of parameters; and controlling the operation of the microwave generator based on the set of parameters comprising the one or more adjusted parameters.
(18) In an embodiment, wherein the set of parameters comprises a parameter for controlling an operation of a motor disposed within the home appliance, wherein the motor is configured to drive a rotor to stir the substance, the method further comprises: controlling an operation of the motor based on the set of parameters comprising the one or more adjusted parameters.
(19) In an embodiment, the method further comprises: receiving temperature measurements from the temperature sensor; and dynamically adjusting the operation of the microwave generator or the motor.
(20) In an embodiment, wherein the home appliance is prestored with a plurality of recipes, and wherein the set of parameters are associated with a recipe of the plurality of recipes.
(21) A third aspect of the present disclosure provides a container for drying a sample, comprising: a body providing a cavity with an opening; a cover configured to enclose the opening of the cavity of the body, the cover comprising a plurality of through holes, wherein the plurality of through holes allows steam to pass through but prevents microwaves from entering the enclosed cavity of the body; and a removable sample holder placed in the cavity of the body configured to hold a sample for drying, wherein at least a portion of the body comprises absorbing material that generates heat by absorbing microwave energy.
(22) In an embodiment, wherein the body comprises a metal part, wherein the cover comprises a metal part and an edge that is made of an insulating material, and wherein the edge of the cover spaces the metal part of the cover from the metal part of the body.
(23) In an embodiment, wherein at least one through hole of the plurality of through holes are configured to allow insertion of a temperature sensor probe.
(24) In an embodiment, the container further comprises: a removable mesh part configured to hold a substance for process and space the substance from a bottom wall or a side wall of the cavity; and a rotor disposed at the bottom of the cavity and driven by a motor outside the cavity, wherein the rotor is configured to promote air circulation within the cavity.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) Embodiments of the present disclosure will be described in even greater detail below based on the exemplary figures. The present disclosure is not limited to the exemplary embodiments. All features described and/or illustrated herein can be used alone or combined in different combinations in embodiments of the present disclosure. The features and advantages of various embodiments of the present disclosure will become apparent by reading the following detailed description with reference to the attached drawings which illustrate the following:

(2) FIG. **1** is a simplified block diagram of an infusion system, according to one or more embodiments of the present disclosure;

(3) FIGS. **2**A-**2**C illustrate an exemplary implementation of an infusion device in front view, side view and top view, respectively, according to one or more embodiments of the present disclosure;

(4) FIGS. **3**A-**3**C illustrate an exemplary container, in accordance with one or more embodiments of the present disclosure;

(5) FIG. **4**A is a schematic illustrating another infusion device for substance extraction, in accordance with one or more embodiments of the present disclosure;

(6) FIG. **4**B is an exploded view of an exemplary implementation of the fixing component as shown in FIG. **4**A;

(7) FIG. **4**C illustrates an alternative implementation of the fixing part as shown in FIG. **4**B, in accordance with one or more embodiments of the present disclosure.

DETAILED DESCRIPTION

(8) The present disclosure provides compact yet powerful extractor systems/devices capable of controlling their operations based on feedback control, thereby achieving precise control over the device and efficient operation for optimized performance.

(9) In particular, exemplary aspects of the infusion systems according to the present disclosure are further elucidated below in connection with exemplary embodiments, as depicted in the figures. The exemplary embodiments illustrate some implementations of the present disclosure and are not intended to limit the scope of the present disclosure.

(10) Throughout the drawings, identical reference numbers designate similar, but not necessarily identical, elements. The figures are not necessarily to scale, and the size of some parts may be exaggerated to more clearly illustrate the example shown. Moreover, the drawings provide examples and/or implementations consistent with the description; however, the description is not limited to the examples and/or implementations provided in the drawings.

(11) Where possible, any terms expressed in the singular form herein are meant to also include the plural form and vice versa, unless explicitly stated otherwise. Also, as used herein, the term “a” and/or “an” shall mean “one or more” even though the phrase “one or more” is also used herein. Furthermore, when it is said herein that something is “based on” something else, it may be based on one or more other things as well. In other words, unless expressly indicated otherwise, as used herein “based on” means “based at least in part on” or “based at least partially on.”

(12) FIG. **1** illustrates a simplified block diagram of an infusion system **100**, according to one or more embodiments of the present disclosure. Each block can include one or more suitable hardware and/or software components to facilitate the functions disclosed therein. The term “infuse,” “infusing” and “infusion” refer to the process of heating, drying, extracting, and/or transforming a substance such as herb, vegetable, or plant, as described hereinafter. According to an embodiment, the system **100** can be a home appliance, such as a standalone table-top unit or a wall unit installed in a home kitchen for personal or family use. According to another embodiment, the system **100** can be an industrial unit installed in a restaurant, hotel, laboratory, hospital, etc., for commercial use. Regardless of the setting, the system **100** has a compact size that is easily moved and installed.

(13) The system **100** includes various components configured to process a sample **118** placed therein. A "sample" refers to any substance to be processed by the system **100** using the energy generated therein. The substance can be of any suitable form, including solid, solution, and more. Processing the sample can include, but is not limited to, drying, distillation, and more. As will be discussed hereafter, the sample **118** can be placed directly inside the system **100** or in a container (e.g., a canister), which is then placed together with the container in the system **100**.
(14) Referring to FIG. **1**, various subsystems in the system **100** are configured to operation in conjunction with other components/subsystems to perform the operations disclosed herein. The subsystems include a sample processing system **110**, a control system **120**, and a feedback system **130**.
(15) In the sample processing system **110**, a microwave generator **112** is configured to produce energy in wave form. For example, the microwave generator **112** can include a component (e.g., a magnetron) that converts electrical energy into microwaves. A waveguide **114** directs the generated microwaves into a chamber **116**, where the sample is placed. The chamber **116** confines the generated microwaves, resulting in a spatial distribution of microwave energy inside. For example, as the microwaves propagate within the chamber **116**, these waves bounce off the walls of the chamber **116**, forming standing waves with nodes and antinodes. The chamber **116** is an interior space within a housing that integrates the components of the system **100** into its frame.
(16) In some embodiments, the sample processing system **110** can include a condenser **134**, which is connected to the chamber **116** via a channel (e.g., an opening **204** as depicted in FIG. **2**A). The condenser **134** can be integrated into the system **100**, or it can be a separate component that connects to the system **100**.
(17) The control system **120** includes various components to control the operation of components in the sample processing system **110**, such as, e.g., one or more processors **122**, a memory **124**, and a communication interface **126**. The components in the control system **120** can be integrated into a control circuitry. Additionally and/or alternatively, the control system **120** can include discrete components that are coupled to each other through wired or wireless connections.
(18) The one or more processors **122** can include any appropriate type of general-purpose or special-purpose microprocessor, digital signal processor, microcontroller, etc. The one or more processors **122** are configured to generate suitable control signals (e.g., electrical signals) according to instructions stored in the memory **124**.
(19) The memory **124** can be configured to store computer-readable instructions that, when executed by the one or more processors **122**, can cause the one or more processors **122** to perform various operations disclosed herein. The memory **124** can be any non-transitory type of mass storage, such as, e.g., volatile or non-volatile, magnetic, semiconductor-based, tape-based, optical, removable, non-removable, or other type of storage device or tangible computer-readable medium including, but not limited to, a read-only memory ("ROM"), a flash memory, a dynamic random-access memory ("RAM"), and/or a static RAM.
(20) The communication interface **126** can be configured to communicate information between the system **100** and other devices or systems, such as, e.g., a server or a terminal device in a connected environment. The communication interface **126** can include a local area network ("LAN") card to provide a data communication connection to a compatible LAN. As another further example, the communication interface **126** can include a high-speed network adapter such as, e.g., a fiber optic network adaptor, 10G Ethernet adaptor, or the like. Wireless links can also be implemented by the communication interface **126**. In such an implementation, the communication interface **126** can send and receive electrical, electromagnetic or optical signals that carry digital data streams representing various types of information via a network. The network can typically include a cellular communication network, a Wireless Local Arca Network ("WLAN"), a Wide Area Network ("WAN"), BLUETOOTH, or the like.
(21) In some embodiments, the system **100** receives instructions on demand or through over-the-air

(OTA) updates pushed by a server via the communication interface **126**. The instructions can include recipes tailored for processing specific samples. The system **100** can store the received instructions in the memory **124**.
(22) In some embodiments, the system **100** connects to the internet through the communication interface **126** to automatically download parameter models (including power curves, temperature, time, weight, etc.). The system **100** then stores the downloaded parameter models in the memory **124**. Users may choose new models at any time to operate the system **100** for infusing new samples (e.g., new plant species). The system **100** can link to electronic terminals such as, e.g., smartphones or personal computers (PCs) for data updates and/or presetting modes, providing users with greater operational flexibility.
(23) The control system **120** generates suitable control signals to control the operation of components in the sample processing system **110** in accordance with the instructions stored in the memory **124**. For example, the control system **120** controls the microwave generator **112** to produce microwaves with a specific wavelength(s) and/or a specific output power. The control system **120** can adjust the operation of the microwave generator **112** during the process of a sample. For example, the control system **120** can determine a change in one or more parameters for the microwave generator **112** according to information obtained from one or more sensors **132**. The control system **120** can adjust the operation of the microwave generator **112** dynamically and/or periodically to ensure precise control of the sample processing.
(24) In an embodiment, the control system **120** controls the operation of a motor integrated in the system **100**. The motor can be included in the control system **120** or can be a separate component connected to the control system **120**. The motor is used to drive a rotor to achieve stirring functionality. For example, the control system **120** generates control signals to drive the motor and rotate the rotor at a predefined speed for stirring. The rotor can be designed in various shapes and sizes according to specific use cases. The control components can adjust the corresponding rotational speed based on the rotor's structural parameters (e.g., size, shape).
(25) In an embodiment, the control system **120** controls the operation of the condenser **134**. For example, the control system **120** can instructs the condenser **134** to start operation at a prescribed time. Additionally and/or alternatively, the control system **120** can adjust the temperature, pressure, flow rate, or other suitable parameters to regulate the operation of the condenser **134**. In some examples, the control system **120** can perform adjustments based on feedback from one or more sensors implemented to monitor the status of the condenser **134** and/or the sample processing system **110**.
(26) The feedback system **130** gathers pertinent information to monitor the status of the sample processing system **110** through the one or more sensors **132**. The feedback system **130** provides the collected information to the control system **120**, enabling the control system **120** to adjust the operation of the system **100**. In some embodiments, the feedback system **130** can be part of the control system **120**. Alternatively, the feedback system **130** can be include separate components that are connected to the control system **120**.
(27) The feedback system **130** can include various types of sensors. A sensor refers to a device that measures a parameter associated with a status of the system **100**. For example, a temperature sensor measures temperature within the chamber **116**, the sample **118** placed directly within the chamber **116**, or the sample **118** placed within a container in the chamber **116** as further described hereinafter. A weight sensor, such as a scale, can be used to measure the weight of the sample **118** to be processed by the system **100**, the combined weight of the sample **118** and its container (e.g., the container **300** depicted in FIG. **3**A), and/or the weight of the system **100** with the sample **118** placed therein. In an embodiment, a sensor can be used to measure the speed of a rotor for monitoring the stirring process. It will be noted that other types of sensors can be utilized to provide relevant information to the control system **120**, which are not limited by the present disclosure.

(28) The one or more sensors **132** can be connected to the control system **120** via wired connections (e.g., cables, analog signal wires, buses, etc.). Additionally and/or alternatively, the one or more sensors **132** can be communicatively connected to the control system **120** through the communication interface **126** (e.g., utilizing a transceiver or similar communication components in the communication interface **126**).
(29) FIGS. **2**A-**2**C demonstrate an exemplary implementation of an infusion device **200** from various perspectives, according to one or more embodiments of the present disclosure. The implementation shown in FIGS. **2**A-**2**C provides an example arrangement of the components depicted in FIG. **1**, resulting in an device **200** with a compact size and capable of achieving precise control over the sample processing.
(30) FIG. **2**A is a front view of the device **200**. The device **200** has a main body **202**, which contains a chamber **216** inside. The chamber **216** is formed by a top surface, a bottom surface, and side surfaces inside the main body **202**. One of the side surfaces inside the main body **202** is a door (e.g., **202** in FIGS. **2**B and **2**C) that can be opened and closed to allow the placement of a sample inside the chamber **216**.
(31) Unlike conventional microwave devices with a left-right layout, the device **200** adopts a top-bottom layout. This top-bottom layout allows the chamber **216** to be arranged at substantially the horizontal center of the device **200** such that the device **200** has a left-right symmetrical appearance. As will be elaborated in further detail, in an embodiment, certain electronic components can be arranged in the bottom of the device **200** under the chamber **216** for stability. As a result, the vertical dimension of the device **200** can be greater than the horizontal dimension. Alternatively, the electronic components can also be arranged above the chamber **216** within the device **200**. The design and/or arrangement of these components in the device **200** can also take into account other considerations, such as safety, interference, circuit layout efficiency, and more.
(32) In an embodiment, the chamber **216** is connected to the outside through an opening **204** provided in the top surface of the chamber **216**. The opening **204** allows excess steam to exit the chamber during certain processes. In another embodiment, the device **200** can not include any opening to the outside. In yet another embodiment, the device **200** can include more than one openings. Moreover, some or all of the openings can be covered or exposed during sample processing. It will be noted that the opening **204** can be of various shapes, such as, e.g., circular, square, etc., and can be set in any appropriate position and coupled with a condenser, which is further described hereinafter.
(33) In an embodiment, the frame of the main body **202** surrounding the chamber **216** is at least two to three centimeters thick. The space created therein can prevent microwave leakage from the chamber **216** to the outside. As shown in FIG. **2**A, the space between the right side of the chamber **216** and the outer shell of the main body **202** can be slightly thicker than the space on the left side. A door locking mechanism **254** can be installed on the right side. When the door **250** is closed, the door locking mechanism **254** latches into one or more keyholes **252** positioned on the frame. The door locking mechanism **254** operates in two steps. For example, when opening the door **250**, the motor first unlocks the door **250** via button control, and then, the door can be pulled open. The motor and button control (and/or other suitable components) are integrated in the door locking mechanism **254**. The door locking mechanism **254** can accommodate various types of locks, including electronic locks, magnetic locks, spring latches, and other suitable locking mechanisms.
(34) Components associates with a microwave generator **112**, such as, e.g., a magnetron **212***a*, a transformer **212***b* (e.g., for converting voltage and/or current signals), and cooling fans **212***c*, which typically have more weight than other components (e.g., the control circuitry **220**) in the device **200**, are located at the bottom of the device **200** to ensure the stability of the machine. As depicted in FIG. **2**A, the cooling fans **212***c* can be placed on either or both sides of the magnetron **212***a* and the transformer **212***b*. This configuration allows for efficient heat dissipation from the magnetron **212***a* and/or the transformer **212***b*. In an embodiment, the cooling fan **212***c* can be arranged on the

same side as the door locking mechanism **254**, as this side has a thicker side frame providing more space due to the installation of the door locking mechanism **254**.

(35) The magnetron **212***a* is connected to a waveguide **214** integrated in the side frame (e.g., at the backside) of the main body **202**. One end of the waveguide **214** connects to the magnetron **212***a*, while the other end connects to a microwave output port **214***a* disposed on the rear wall of the chamber **216**, as depicted in FIG. **2**A. The waveguide **214** directs the microwaves generated in the magnetron **212***a* to enter the chamber **216** through the microwave output port **214***a*. In this configuration, the generated microwave propagates inside the chamber **216** along a horizontal plane.

(36) A motor **240** is arranged near the bottom surface of the chamber **240** to ensure coupling/connection with a rotor (e.g., rotor **304** in FIG. **3**B, or rotor **51** in FIG. **4**A) placed inside the chamber **216**. The rotor is configured to rotate in a horizontal plane parallel to the propagation direction of the microwaves inside the chamber **216**, thus minimizing interference from the microwaves.

(37) As such, most of the electronic components are arranged at the bottom of the device **200**, allowing for overall stability and an efficient circuit layout design.

(38) A control circuit **220** (e.g., in a printed circuit board) is integrated in the side frame of the main body **202**. The control circuit **220** can integrate components of the control system **120** as depicted in FIG. **1**, such as, e.g., the processors **122**, the memory **124**, and/or the communication interface **126**. The control circuit **220** is connected to the other components integrated in the device **200**, such as, e.g., the magnetron **212***a*, the transformer **212***b*, cooling fans **212***c*, the motor **240**, the door locking mechanism, the one or more temperature probes **232***a*, the scale **234**, and more.

(39) One or more temperature probes **232***a* can be installed in the chamber **216** or removed from the chamber **216** through corresponding connectors **232** at any suitable position in the chamber **216**.

(40) In some embodiments, the connectors **232** are constructed from metal components assembled together, with gaps between the metal joints. Microwave emissions directly from the output port **214***a* have high energy density (since microwaves enter the chamber **216** via the port **214***a*), especially in the direct emission zone. Direct contact with microwaves through these gaps significantly increases the risk of sparking. Therefore, the connectors **232** should be placed to avoid direct exposure to the microwave output from the microwave output port **214***a*. For example, the central positions both vertically and horizontally within the chamber **216** should be avoided.

(41) In this example implementation as depicted in FIGS. **2**A-**2**C, the connectors **232** can be arranged in the upper left portion inside the chamber **216**, near the top left or front, avoiding the central position. For example, FIGS. **2**A-**2**C depict an exemplary configuration for placing the connectors **232**. The temperature probes **232***a* are connected to the control circuitry **220** (e.g., through the connectors **232**) for transmitting the measurement results. In alternative embodiments, the connectors **232** may also be arranged in other places within the chamber **216**, such as near the top-right corner, the bottom-right corner, or the bottom-left corner of the chamber **216**, but are not limited to these locations.

(42) In this configuration, the control circuitry **220** is positioned on the right side inside the side frame of the main body **202**, as shown in FIG. **2**A. Placing the connectors **232** on the same side increases the space required on this side. Therefore, the temperature connectors **232** are situated on the upper left inside the chamber **216** to utilize the available space effectively. This also allows convenient removal of the temperature probes **232***a* from the chamber **216**.

(43) A scale **234** is integrated or mounted on top of the main body **202**. As shown in FIGS. **2**B and **2**C, the scale **234** is designed with a through hole that aligns with the opening **204**. Additionally, the scale **234** includes a scale plate **234***a* for placing the sample for weighing, as well as a panel **234***b* for controlling and displaying. The scale plate **234***a* is removable, facilitating convenient installation and maintenance.

(44) In some variations, the scale **234** can take other forms and be positioned at other suitable locations on the main body **202**. For example, the scale **234** can be integrated into or attached to a top/bottom corner of the main body **202**.
(45) The scale **234** is connected to the control circuitry **220**. The scale **234** is powered through the control circuitry **220** and transmits measurement results to the control circuitry **220**. Upon receiving the measurement results from the scale **234**, the control circuitry **220** determines suitable parameters for other components in the device **200** to operate according to a predetermined setup (e.g., a recipe). For example, before processing, the sample is weighed by the scale **234**. Based on the weight measured by the scale **234**, the control circuitry **220** determines parameters for the magnetron **212***a* for generating microwaves of a target output power according to a correspondence stored in the memory **124**. In another example, the control circuitry **220** determines parameters for the motor **240** to facilitate stirring at a specific speed. The device **200** can automatically adjust a rotor speed (through the motor **240**) for optimal sample processing (e.g., drying, extraction, or decarboxylation) based on the weight of the material being processed. The amount of solution and material can affect the efficiency of a rotor. For example, too little liquid at high speed can cause splashing, whereas too much liquid can lead to rotor displacement. The device **200** can automatically adjust to prevent these occurrences.
(46) The rotor speed can be associated with various factors, such as the size and shape of the rotor, the capacity of the container, the amount of sample (or substance) to be processed, and more. In some embodiments, the control circuitry **220** can store predefined ranges corresponding to these factors.
(47) Table 1 provides examples of rotor speed ranges, when a rotor with dimensions of 0.8 by 2.5 centimeters is used with a container that has a capacity of 1000 milliliters for processing a specific amount of substance mixed or dissolved in a specific amount of oil.
(48) TABLE-US-00001 TABLE 1 Container capacity: 1000 milliliters. Oil Substance Rotor speed range (in milliliters) (in grams) (in revolutions per minute) 500 10 1500-2000 20 1500-2000 30 1600-2000 40 1700-2000 50 1800-2000 400 8 1500-1600 16 1600-1800 24 1500-1600 32 1500-1700 40 1600-1800 300 6 900-1200 12 1000-1200 18 1000-1400 24 1100-1500 30 1100-1600 200 4 600-800 8 700-800 12 700-800 16 800-900 20 800-900
(49) Similar ranges can be defined for other conditions. The rotor speed ranges suggest optimized operational conditions in which the rotor speed remains relatively stable with no skipping or bouncing. Below the minimum value of the range, the center of the rotor becomes unstable and wobbles from side to side. Exceeding the maximum value of the range results in vortices, with higher sides and a lower center, causing the rotor to become unstable and leading to skipping and bouncing. The correspondence between the speed ranges and relevant factors can be prestored in the memory of the control circuitry **220**. In some examples, the speed ranges are associated with one or more recipes prestored in the control circuitry **220**.
(50) In some examples, at a specific condition, the rotor can be controlled to operate within a sub-range of the range shown in Table 1. For example, according to Table 1, for a 30-gram substance in 500-milliliters of oil, the speed range can be between 1600 and 2000 revolutions per minute (rpm), such as, e.g., from 1700 to 2000 rpm, from 1800 to 2000 rpm, from 1900 to 2000 rpm, from 1600 to 1700 rpm, from 1600 to 1800 rpm, from 1600 to 1900 rpm, etc.
(51) In some embodiments, the material to be processed and the container holding the material are weighed together, and the device **200** determines the corresponding recipe based on the total weight obtained. For example, the device **200** can be configured to use different standard containers for the corresponding processing. Thus, when a specific mode (e.g., drying, extraction, or decarboxylation) is selected, the device **200** can choose or adjust the recipe based on a prestored weight of the corresponding standard container for the selected mode. In some examples, each recipe (corresponding to a set of parameters with preset values) corresponds to a range of weights, allowing a specific recipe or its adjustment to be determined based on the measured weight falling

within that range.
(52) The system **100** and device **200** can operate in different modes to facilitate various sample processing methods, including, e.g., drying, extraction, decarboxylation, and/or distillation. The sample can be placed directly in the chamber (e.g., **116** or **216**). In some embodiments, the sample can be placed in the chamber (e.g., **116** or **216**) with a container. The container can be of various types that made of non-mental materials, such as, e.g., water cups, dining bowls, laboratory glassware, etc. In some embodiments, the sample can be placed in a specially designed container to facilitate other functions.
(53) FIGS. **3**A-**3**C illustrate an exemplary container **300**, in accordance with one or more embodiments of the present disclosure. The container **300** can be used in connection with the system **100** or the device **200** for drying a sample. However, it will be noted that the container **300** can be place in other suitable devices/systems utilizing microwave for heating and/or drying.
(54) As shown in FIG. **3**A or **3**B, the container **300** includes a body **10**, a cover **20**, and a sample holder **302**.
(55) The body **10** comprises a body **11** and a container edge **13**. The body **11** is cylindrical with one side open, forming a container opening **17** on the open side and an inner cavity **15** inside. Through the container opening **17**, the sample holder **302** can be placed inside the inner cavity **15**, and further, materials can be placed in the placement component **30**.
(56) The body **11** includes a bottom wall **113**, a side wall **111**, and a protrusion **117**. The bottom wall **113** and the side wall **111** form a box shape with one side open, with the side wall **111** rising from the bottom wall **113** and surrounding the bottom wall **113** to form the aforementioned inner cavity **15**. The protrusion **117** is located at one end of the side wall **111** away from the bottom wall **113**.
(57) The body **11** can be made of microwave-transmitting material. However, it is noted that the body **11** can include a composite of microwave-transmitting material or microwave-insulating material with absorbing material. It is noted that microwave-insulating material does not have to completely block microwave transmission; it can also include low-transmission materials with a transmittance of from 0% to 10%, such as, e.g., from 1% to 10%, from 2% to 10%, from 3% to 10%, from 4% to 10%, from 5% to 10%, from 6% to 10%, from 7% to 10%, from 8% to 10%, from 9% to 10%, from 0% to 9%, from 0% to 8%, from 0% to 7%, from 0% to 6%, from 0% to 5%, from 0% to 4%, from 0% to 3%, from 0% to 2%, from 0% to 1%, etc. In some embodiments, the body **11** can include non-magnetic metals or non-metallic media, which are thermally conductive materials with good thermal conductivity sufficient for transferring heat, such as, e.g., copper, aluminum, etc. In some embodiments, the body **11** can include absorbing materials at the bottom wall **113** of the body **11**. For example, the bottom wall **113** can be made of a material containing absorbing material, or absorbing material (e.g., **306** as shown in FIG. **3**B) can be disposed onto the surface of the bottom wall **113** by fitting, coating, or fastening. In some embodiments, a portion of the side wall **111** can also include absorbing material. The absorbing material described herein refer to any material with a high microwave absorption rate sufficient for absorbing microwave energy to convert into heat, such as, e.g., graphite, silicon carbide, etc.
(58) In an embodiment, an isolation part **115** is formed on the bottom of the body **11**, to prevent overheating of the bottom wall **113** due to direct contact with the placement surface of the infusion system/device (e.g., the bottom surface of the chamber **216** as depicted in FIG. **2**A or **2**B). The isolation part **115** can be block-shaped as shown in FIG. **3**B. However, it is noted that the shape of the isolation part **115** can be changed into other appropriate shapes, and one or more isolation parts **115** can be utilized. The isolation part **115** can be made of thermal insulation material, preventing other components from melting due to contact with the bottom wall **113**. In some embodiments, the container **300** (e.g., the body **11**) can not include any isolation parts **115**.
(59) The bottom wall **113** can be planar, though other configurations are also feasible. For example, the bottom wall **113** can include one or more curved surfaces or irregular surfaces. The side wall

111 can extend in a straight line and connect the bottom wall **113** and the protrusion **117**. However, it will be noted that other configurations are also feasible. For example, the side wall **111** can extend in a curved line or a combination of curved and straight lines. Furthermore, the orientation of the protrusion **117** is not limited as long as it intersects with the side wall **111**. For example, the protrusion **117** can protrude towards the inner cavity **15** of the body **10**. Moreover, the shape of the protrusion **117** is not limited as long as it can be installed in conjunction with the container edge **13**. In some embodiments, the container **300** may not include the protrusion **117**. In this configuration, the side wall **111** can be directly installed in conjunction with the container edge **13**. For example, an end portion on the side of the side wall **111** can be directly installed in conjunction with the container edge **13**.

(60) FIGS. **3**B and **3**C demonstrate the container edge **13** installed in conjunction with the protrusion **117** at the container opening **17**. FIG. **3**C magnifies the region **310** from FIG. **3**B. The container edge **13** includes a first abutment portion **131**, a second abutment portion **133**, and a third abutment portion **135**. The first abutment portion **131** is U-shaped, with its opening facing the protrusion **117**, and a groove **1311** matching the protrusion **117** is formed inside. The second abutment portion **133** extends from the first abutment portion **131** towards the side wall **111** of the box main body **11** and abuts against the side wall **111**. The third abutment portion **135** extends from the first abutment portion **131** towards one side away from the second abutment portion **133** and abuts against the cover **20**. It is understood that in some embodiments, the second abutment portion **133** and the third abutment portion **135** can be omitted. The container edge **13** can be made of insulating material, such as, e.g., silicone, rubber, plastic, etc., to prevent sparking when the cover **20** contains non-magnetic metal while the body **10** contains non-magnetic metal.

(61) Referring to FIG. **3**A, the cover **20** has a lid **21** and a handle **23**. The handle **23** grips the lid **21** and is made of heat-resistant insulation materials such as, e.g., silicone, rubber, plastic, wood, etc. The handle **23** can be positioned at the geometric center, center of gravity, or any arbitrary point on the lid **21**. The lid **21** is made of microwave-insulating material, with a plurality of through holes **219** to prevent microwaves from entering the inner cavity **15**. The through holes **219** can adopt various suitable designs to block microwaves. For example, the through holes **219** can be small enough to allow very little or no microwave energy to enter the inner cavity **15**. Alternatively, the through holes **219** can be inclined or curved relative to the vertical direction, making it difficult for microwaves to pass through the through holes **219** into the inner cavity **15**. The through holes **219** can be arranged according to a predefined pattern or randomly. The size of the through holes **219** can be uniform or varied. For example, in some embodiments, the area occupied by the through holes **219** on the lid **21** can be 50% or more, such as, e.g., from 55% to 100%, from 60% to 100%, from 65% to 100%, from 70% to 100%, from 75% to 100%, from 80% to 100%, from 85% to 100%, from 90% to 100%, from 95% to 100%, from 50% to 95%, from 50% to 90%, from 50% to 85%, from 50% to 80%, from 50% to 75%, from 50% to 70%, from 50% to 65%, from 50% to 60%, from 50% to 55%, etc. The arrangement of the through holes **219** can align with the position of the material, such as, e.g., overlapping with the location of the sample holder **302**. Additionally, the size and density of the through holes **219** can be adjusted based on the depth distribution of the sample holder **302** where the material is placed. In this regard, liquid medium can be evaporated and quickly discharged from the container **300** through the through holes **219**.

(62) In some embodiments, one or more temperature probes (e.g., temperature probe **232***a* as depicted in FIG. **2**A) can be inserted into the container **300** via one or more through holes **219** in the lid **21**. In this configuration, the temperature inside the container **300** can be measured and used to adjust the sample processing. The one or more temperature probes, when inserted into the one or more through holes **219** in the lid **21**, are hold in place to prevent contact with metal parts (such as a metal part in the cover **20** or a metal part of the body **10**). For example, the temperature probe(s) can be inserted into a fixing part **32** as depicted in FIG. **4**C, which can include or be coupled to a protruding part that can be secured to a section of lid **21**. In some embodiment, the handle **23** can

be configured to receive the temperature probe that extend through the handle **23** into the container **300**. For example, the handle **23** can include a through hole that receives and holds the temperature probe in place so as to prevent the temperature probe from contacting other metal parts. As another example, a portion of the handle **23** can be removed after the cover **20** is replaced. The remaining portion of the handle **23** on the cover **20** can include a through hole for receiving and holding the temperature probe in place.

(63) As shown in FIG. **3**C, the lid **21** includes a covering part **211**, a connecting part **213**, and a cover abutment part **215**. The covering part **211** is used to cover the material in the inner cavity **15**. The handle **23** and some or all of the through holes **219** are arranged on the covering part **211**. One end of the connecting part **213** is connected to the covering part **211**, and the other end is connected to the cover abutment part **215**. The connecting part **213** can extend at an angle or in a curved manner, and the direction and slope of the extension can be changed as needed. One end of the cover abutment part **215** is connected to the connecting part **213**, and the other end, which is on the side away from the handle **23**, contacts the second abutment portion **133**. Additionally, in this embodiment, the bottom surface of the handle **23** abuts against the first abutment portion **131**. However, the bottom surface of the cover abutment part **215** can abut against any part of the container edge **13**.

(64) Furthermore, in some embodiments, the connecting part **213** and the cover abutment part **215** can be omitted. In this configuration, the covering part **211** can extend to the second abutment portion **133** to act as the cover abutment part **215**.

(65) The sample holder **302** is placed in the inner cavity **15** and configured to hold the material to be dried. In an embodiment, the sample holder **302** can include a mesh for placing the material. The mesh part **302** can be made of various materials, such as, e.g., non-thermal conductive materials or thermal conductive materials. The mesh in the sample holder **302** can be spaced from the bottom wall **113** of the body **10**. This prevents the bottom of the mesh, which holds the material, from directly contacting the bottom wall **113** of the body **10**, thereby avoiding overheating the material at the bottom of the mesh. In an embodiment, the mesh that holds the material is also spaced from the side wall **111** of the body **10**.

(66) In some embodiments, the outer surface of the non-magnetic metal discussed above can include a dielectric coating. The material for the dielectric coating can be selected from one or more of glass, ceramic, Teflon, polyethylene, and/or any suitable combination thereof. The non-magnetic metal can be made from at least one of copper, aluminum, zinc, and/or any suitable combination thereof.

(67) The container **300** can be used to dry a sample when operating with an infusion device (e.g., the infusion system/device disclosed herein) that provides microwave energy. To dry the sample using the container **300**, the sample is placed on the sample holder **302** that is placed inside the cavity **15** of the container **300**, and then the container **300** is covered with the cover **20**. Next, the container **300** containing the sample is placed inside the infusion device. During operation, the microwaves generated by the infusion device are absorbed by the absorptive material contained in the bottom wall **113** (and/or the side wall **111**) to generate heat. The heat is transferred to other parts of the container body **11** (e.g., the bottom wall **113**), and part of the heat is transmitted to the sample inside the cavity **15**. In this process, the moisture and other media contained in the sample are heated and evaporated from the sample. The evaporated medium is expelled to the outside of the container **300** via the through holes **219** on the lid **21**. This way, the sample is dried.

(68) In an embodiment, a rotor **304** can be disposed at the bottom of the cavity **15**. The rotor **304** can be driven by the motor (e.g., **240** as depicted in FIG. **2**A or **2**B) to rotate inside the cavity **15**. This promotes air circulation within the cavity **15**, thereby achieving more uniform and efficient heating of the sample.

(69) In an embodiment, the infusion device **200** (or the infusion system **100**) is used to dry the sample contained in the container **300**. Before placing the sample in the container **300**, the sample

can first be weighed by the scale **234**. Based on the measured weight, the control circuitry **220** can determine one or more suitable parameters to operate one or more components in the device **200** according to a correspondence (e.g., a recipe) prestored in the memory. For example, the control circuitry **220** determines an output power for the magnetron **212***a* and/or a rotation speed for the motor **240**. One or more temperature probes **232***a* can be connected to the container **300** or any other spot within the chamber **216**. The device **200** operates according to one or more parameters determined by the control circuitry **220**. During the drying process, the control circuitry **220** can monitor the temperature status based on measurements from the one or more temperature probes **232***a*. Additionally, the control circuitry **220** can adjust the operation of certain components (e.g., the magnetron **212***a* and/or the motor **240**) therein based on the measurement results from the sensor. This allows the device **200** to achieve uniform heating and efficient drying of the sample.
(70) FIG. **4**A is a schematic illustrating another infusion device **400** for substance extraction, in accordance with one or more embodiments of the present disclosure. The device **400** can include some or all of the components and/or functions of the infusion system **100** or the infusion device **200**. This example demonstrates an exemplary setup for extraction operation performed by the device **400**.
(71) As shown in FIG. **4**A, the device **400** includes a main body **80**, a controller **60**, and a waveguide **70** for transmitting microwaves.
(72) A cavity **1** is provided in the main body **80**. A sample to be processed **90** is placed on the bottom surface **402** of the cavity **1**. In this example, the sample **90** is contained in a container **10**.
(73) In this implementation, a magnetic field generator **52** and a motor **53** are integrated in the frame of the main body **80**. The motor **53** is controlled by the motor control processor **62**. The magnetic field generator **52** is configured to generate two or more magnetic fields with different polarities and is connected to an output end of the motor **53**. The magnetic field generator **52** is coupled to a magnetic rotor **51** placed proximate to the bottom surface **402** of the cavity **1**. The magnetic rotor **51** is placed at the bottom of the container **10** within the sample solution **90**. The magnetic rotor **51** has two polarities. When the motor **53** operates, the magnetic field generator **52** rotates, generating an alternating magnetic field across the rotor **51**. This induces varying electromagnetic currents in the magnetic rotor **51**, causing it to rotate and thereby stirring the sample solution **90**.
(74) However, it will be noted that other suitable components can be utilized to generate an alternating magnetic field. Additionally and/or alternatively, other suitable techniques can be utilized to stir the sample to achieve similar technical effect.
(75) The controller **60** is integrated in the frame of the main body **80**, and is used to control the operation of various components of the device **400**. The controller **60** includes various components, such as, e.g., a temperature control processor **61**, a motor control processor **62**, and a microwave generator **63** configured to generate microwaves, and a power control unit **64**.
(76) The microwave generator **63** includes a magnetron configured to generate microwaves. The microwave generator **63** produces the microwaves at a set output power.
(77) The power control unit **64** can be configured to adjust an input voltage of the microwave generator **63**. For example, the power control unit **64** includes a transformer for adjusting the input voltage of the microwave generator **63** according to one or more parameters such as temperature provided by a temperature probe **410**.
(78) Thus, the power control unit **64** can adjust the output power of the microwave generator **63**, thereby controlling the heating temperature of the sample **90**.
(79) The microwave generator **63** is connected to a waveguide **70** arranged on one surface (e.g., a sidewall) of the cavity **1**. The microwave generated by the microwave generator **63** is transmitted to the waveguide **70**. The waveguide **70** directs the microwave generated by the microwave generator **63** to enter the cavity **1**. In an embodiment, the waveguide **70** can be arranged near the back surface of the cavity **1** opposite to the front door of the device **400**, so that the microwave generated by the

microwave generator **63** enters the cavity **1** from the back surface of the cavity **1**. This design can further allow a compact size of the device **400** in the horizontal direction.
(80) The temperature control processor **61** is connected to one or more temperature sensors in the cavity. The one or more temperature sensors (e.g., a temperature probe **410**) can be utilized to measure temperature in the sample **90** and/or the cavity **1**. The temperature control processor **61** receives measurement results from the one or more temperature sensors. In some examples, the temperature control processor **61** can cause display of the temperature information on a display (e.g., a display panel integrated in the main body **80**, a display of a terminal device, etc.). The device **400** can inform the user of the current heating situation. In some instances, the temperature control processor **61** can cooperate with other components in the controller **60** to change or adjust the operation of those components. For example, the temperature control processor **61** can be connected to the power control unit **64** and/or the microwave generator **63** to adjust the heating temperature of the sample **90**.
(81) In an example, the container **10** contains a mixture of liquid medium and the material to be infused **90**. The container **10** can be made of a material that can penetrate microwaves. Additionally, an opening (not shown) is provided on the side of the container **10** facing away from the surface **11**, which is used for introducing the sample **90** (e.g., the mixture containing the processed material). The shape of the container **10** is not limited to a U-shaped cross-section and can be set arbitrarily.
(82) A fixing component **30** is used to fix a temperature probe **410** at a predefined position in the container **10** so that the temperature probe **410** detects the internal temperature of the container **10**. The fixing component **30** includes a cover **31** that covers the opening side of the container **10**, and a fixing part **32** arranged on the upper surface **311** of the cover **31**.
(83) In an embodiment, the heating temperature of the sample **90** can be controlled by continuously adjusting the output power of the microwave generator **63**. For example, the heating temperature of the sample **90** can be set to 80 Degree Celsius according to a user input. At the beginning of the heating process, the power control unit **64** can control the microwave generator **63** to generate the microwaves at 100% output power. When the heating temperature reaches 81 Degree Celsius as indicated by signals from the temperature probe **410**, the power control unit **64** can continuously reduce the output power of the microwave generator **63** so as to prevent the heating temperature of sample **90** from going further up. When the heating temperature decreases to 79 Degree Celsius as indicated by signals from the temperature probe **410**, the power control unit **64** can continuously increase the output power of the microwave generator **63** so as to prevent the heating temperature of sample **90** from going further down.
(84) In another embodiment, heating temperature of the sample **90** can be controlled by a step adjustment of the output power of the microwave generator **63**. For example, the heating temperature of the sample **90** can be set to 80 Degree Celsius according to a user input. At the beginning of the heating process, the power control unit **64** can control the microwave generator **63** to generate the microwaves at 100% output power. When the heating temperature reaches 81 Degree Celsius as indicated by signals from the temperature probe **410**, the power control unit **64** can reduce the output power of the microwave generator **63** by steps so as to prevent the heating temperature of sample **90** from going further up. For example, the power control unit **64** can decrease the output power of the microwave generator **63** from 100% by 10% for each step until the heating temperature reaches a desired value. When the heating temperature decreases to 79 Degree Celsius as indicated by signals from the temperature probe **410**, the power control unit **64** can increase the output power of the microwave generator **63** by steps so as to prevent the heating temperature of sample **90** from going further down. For example, the power control unit **64** can increase the output power of the microwave generator **63** from 30% by 10% for each step until the heating temperature reaches a desired value.
(85) The simplest form of the step adjustment described above is a binary adjustment. For example,

when the heating temperature reaches 81 Degree Celsius as indicated by signals from the temperature probe **410**, the power control unit **64** can reduce the output power of the microwave generator **63** to 0% by turning off the microwave generator **63**. When the heating temperature decreases to 79 Degree Celsius as indicated by signals from the temperature probe **410**, the power control unit **64** can turn on the microwave generator **63** to its full output power.

(86) FIG. **4**B is an exploded view of an exemplary implementation **450** of the fixing component **30** as shown in FIG. **4**A.

(87) As shown in FIG. **4**B, the cover **31** is disk-shaped and includes a first through hole **301** that penetrates at the central position. The first through hole **301** can be circular. However, it will be noted that the first through hole **301** is not limited to the circular shape and can be set in other appropriate configurations (e.g., positions other than the center of the cover **31**) as long as the space of the first through hole **301** is sufficient for the temperature probe **40** to pass through freely.

(88) The edge of the cover **31** includes a blocking wall **313** that bends and extends towards the container **10**. The blocking wall **313** can prevent the cover **31** from shifting due to movement, handling of the container **10**, or boiling of the sample solution **90**. However, it will be noted that other suitable structures, such as, e.g., a clamping wall, threaded mounting wall, etc., can be used.

(89) The fixing part **32** covers the first through hole **301** of the cover **31**. The fixing part **32** has a first surface **321**, a second surface **322**, and a second through hole **302**. The first surface **321** abuts the upper surface **311** of the cover **31**. The second surface **322** is located away from the first surface **321** and has a smaller area than the first surface **321**. The second through hole **302** penetrates from the first surface **321** to the second surface **322**. The cross-section of the fixing part **32** decreases from the first surface **321** towards the second surface **322**. For example, in some embodiments, the cross-section of the fixing part **32** gradually decreases from the first surface **321** towards the second surface **322**, forming a truncated pyramid or truncated cone shape as shown in FIGS. **4**A and **4**B. The side surfaces of the truncated pyramid or truncated cone can include inclined surfaces, curved surfaces, or other suitable shapes. In some embodiments, the cross-section of the fixing part **32** decreases in steps from the first surface **321** to the second surface **322**, resulting in stepped side surfaces. In some embodiments, the side surfaces include both stepped and gradually decreasing parts. It is noted that the shape and size of the first surface **321** and the second surface **322** of the fixing part **32** can be set arbitrarily, as long as the first surface **321** does not pass through the first through hole **301**.

(90) The second through hole **302** connects the first surface **321** and the second surface **322** and fits tightly with the temperature probe **410**. In other words, the second through hole **302** allows the temperature probe **410** to be inserted under force and holds the temperature probe **410** so that it does not move up and down in the second through hole **302**. The wall of the second through hole **302**, particularly where it interfaces with the temperature probe **410**, includes elastic insulating material. This design can, e.g., help prevent damage to the temperature probe **410** during insertion and removal, allowing it to be securely held in the second through hole **302**. Moreover, the clastic insulating material can prevent heat accumulation that could affect the temperature detection of the temperature probe **410**. Furthermore, the second through hole **302** can extend along an axis perpendicular to the first surface **321** and through the center of the second surface **322**, so that even if the container **10** moves or rotates, the fixing part **32** can stably hold the temperature probe **410**.

(91) The cover **31** and the fixing part **32** can be made of any material that allows penetration of microwaves. The cover **31** and the fixing part **32** can be integrally formed or separately formed.

(92) By fixing the fixing component **30**, the temperature probe **410** is fixed at a predefined position in the container **10**, with one end **414** extending into the container **10**, a middle part positioned inside the second through hole **302** of the fixing part **32**, and the other end **412** located above the fixing part **32**. The temperature probe **410** can adopt existing structures. For example, the temperature probe **410** can be long and tubular, with two opposite ends, such as, e.g., a first end **414** and a second end **412**. The first end **414** is placed close to the surface **402**, and the first end **414**

contacts the sample solution **90**. The second end **412** is connected to the controller **60** (e.g., the temperature control processor **61**), configured to send the detected temperature to the controller **60**. The temperature probe **410** can be perpendicular to the surface **402** but can also be inclined as long as it does not contact any part of the container **10**.

(93) FIG. **4**C illustrates an alternative implementation **460** of the fixing part **32** as shown in FIG. **4**B, in accordance with one or more embodiments of the present disclosure. In this example, the fixing part **32***a* has a first surface **321***a*, a second surface **322***a*, and a second through hole **302***a*. Unlike the design of the fixing part **32** as depicted in FIG. **4**B, the first surface **321***a* and the second surface **322***a* of the fixing part **32** have the same area, and the side walls between these two surfaces form a 90-degree angle with the surfaces. Similar to the second through hole **302** as depicted in FIG. **4**B, the temperature probe **410** can be inserted into the second through hole **302***a* in the fixing part **32***a* and held in place for temperature measurement. Additionally, the fixing part **32***a* can be designed with a notch **462** to hold the connector (e.g., connector **232** as depicted in FIG. **2**A) attached to one end of the temperature probe **410** when the connector is removed from the infusion system/device. The notch **462** can be of various shapes, locations, and numbers, which are not limited by the present disclosure.

(94) The designs of the fixing part (e.g., **32** or **32***a*) and the cover (e.g., **31**) described herein are merely examples. It should be noted that other shapes, sizes, and structures can also be used. The three-part design described here, which includes a separate and combinable temperature probe (e.g., **410**), fixing part (e.g., **32** or **32***a*), and cover (e.g., **31**), allows these components to be configured in various combinations as needed (e.g., based on size requirements) to achieve a broader range of applications.

(95) When the device **400** operates in the extraction mode, microwaves generated within the chamber **1** cause the sample (e.g., the solution **90** contained in the container **10**) to heat up. During the heating process, the rotor **51** is continuously rotated by the motor **53** to ensure uniform heating of the solution and uniform concentration of extracted components. The temperature probe **410** continuously monitors the solution temperature and provides feedback to the controller **60**. When the temperature reaches the set value, the controller **60** can gradually reduce the power of the microwave generator **63** (e.g., a magnetron) through the power control unit **64**, thereby maintaining the solution within a specified temperature range, as described in greater details above.

(96) When the device **200** is used for extraction, before placing the sample inside the chamber **216**, the sample **90** can be weighed by the scale **234**. Based on the measured weight, the control circuitry **220** can determine a set of parameters to control the extraction operation, so that the extraction is optimized based on the weight of the sample.

(97) In an embodiment, the infusion systems/devices and/or containers disclosed in the present disclosure can be used for other sample processing.

(98) For example, the infusion system/device provided herein can operate in a decarboxylation mode, for example, for processing plant matters. Decarboxylation aims to convert THCA components in the material into THC by removing the carboxyl group (—COOH). The principle involves exposing the material to a specific high temperature environment for a certain period to achieve decarboxylation. Utilizing the high-temperature function provided by the infusion system/device provided herein can achieve this purpose.

(99) In an example, a sample is placed in a container (e.g., the container **300** as depicted in FIGS. **3**A-**3**C or other suitable containers), which is then placed in the infusion device **200** (or the infusion device **400**) for decarboxylation. During decarboxylation, the device **200** can first operate at a full power, rapidly raising the temperature inside the container. After a period of time, the power is gradually reduced and eventually maintained at low power until the process is complete. The power control process as described in greater details above in connection with the microwave generator **63** and the power control unit **64** is used to prevent the temperature inside the container from becoming too high, thereby maintaining it at a target temperature level. In accordance with

embodiments of the disclosure, the approach can achieve, e.g., optimal decarboxylation results.

(100) In another example, the infusion system/device provided herein can be used for collecting essential oil. The process involves heating the sample to generate steam and directing the generated steam to a condenser (e.g., the condenser **134** as depicted in FIG. **1**). The condenser then cools the steam and separates different components to obtain the essential oil product in layers. For example, a condenser can be connected to the infusion device **200** via the opening **204**. As such, the steam exiting from the chamber **216** can be collected by the condenser then condensed into oil.

(101) In some embodiments, the infusion systems/devices provided in the present disclosure can be utilized to facilitate sample processing across different stages and through different modes. The corresponding recipes can be restored in the infusion systems/devices, allowing users to conveniently access them at any time. Additionally, the infusion systems/devices can automatically adjust the existing recipes based on the weight of the sample to be processed, achieving optimized performance.

(102) In some embodiments, the infusion systems/devices can be used to extract cannabinoids. When preparing the sample, pre-processed hemp or *cannabis* flower and leaf raw materials are mixed with suitable edible oil, such as, e.g., olive oil, coconut oil, peanut oil, rapeseed oil, soybean oil, honey, or butter. The mixed sample is placed in a container and the container is placed in an infusion system/device (e.g., the infusion device **200**). A temperature probe (e.g., **232***a* as shown in FIG. **2**A) is inserted into the container to measurement the temperature of the sample. A rotor (e.g., **51** as shown in FIG. **4**A) is placed inside the container. A condenser (e.g., **134** as shown in FIG. **1**) is connected to the infusion system/device (e.g., through the opening **204**). The infusion system/device can retrieve the parameters based on the prestored recipes to run the process. Alternatively, the infusion system/device can setup the process based on user inputs. In some examples, the infusion system/device can adjust the parameters based on a measured weight of the sample. For example, the infusion system/device sets the output power for the microwave to 800 watts, the temperature for extraction to 130 Degree Celsius, the extraction time to 30 minutes, and the rotation speed for the rotor to 200 revolutions per minute or higher. The infusion systems/devices can obtain the cannabinoids through the controlled process disclosed herein. For example, the set of parameters can be stored in the infusion systems/devices corresponding to a specific sample or target end product (e.g., cannabinoids) with a reference weight (or a reference weight range) under a specific mode (e.g., the decarboxylation mode). It will be noted that other suitable recipes can be prestored in the infusion systems/devices. Additionally, the recipes prestored in the infusion systems/devices can be removed and/or updated.

(103) It is noted that the techniques described herein can be embodied in executable instructions stored in a computer readable medium for use by or in connection with a processor-based instruction execution machine, system, apparatus, or device. It will be appreciated by those skilled in the art that, for some embodiments, various types of computer-readable media can be included for storing data. As used herein, a "computer-readable medium" includes one or more of any suitable media for storing the executable instructions of a computer program such that the instruction execution machine, system, apparatus, or device can read (or fetch) the instructions from the computer-readable medium and execute the instructions for carrying out the described embodiments. Suitable storage formats include one or more of an electronic, magnetic, optical, and electromagnetic format. A non-exhaustive list of conventional exemplary computer-readable medium includes: a portable computer diskette; a random-access memory (RAM); a read-only memory (ROM); an erasable programmable read only memory (EPROM); a flash memory device; and optical storage devices, including, e.g., a portable compact disc (CD), a portable digital video disc (DVD), etc.

(104) It should be understood that the arrangement of components illustrated in the attached Figures are for illustrative purposes and that other arrangements are possible. For example, one or more of the elements described herein can be realized, in whole or in part, as an electronic

hardware component. The elements can be implemented in software, hardware, or a combination of software and hardware. Moreover, some or all of these other elements can be combined, some can be omitted altogether, and additional components can be added while still achieving the functionality described herein. Thus, the subject matter described herein can be embodied in many different variations, and all such variations are contemplated to be within the scope of the claims.
(105) To facilitate an understanding of the subject matter described herein, many aspects are described in terms of sequences of actions. It will be recognized by those skilled in the art that the various actions may be performed by specialized circuits or circuitry, by program instructions being executed by one or more processors, or by a combination of both. The description herein of any sequence of actions is not intended to imply that the specific order described for performing that sequence must be followed. All methods described herein may be performed in any suitable order unless otherwise indicated herein or otherwise clearly contradicted by context.
(106) The terms used in the claims should be construed to have the broadest reasonable interpretation consistent with the foregoing description. For example, the use of the article “a” or “the” in introducing an element should not be interpreted as being exclusive of a plurality of elements. Likewise, the recitation of “or” should be interpreted as being inclusive, such that the recitation of “A or B” is not exclusive of “A and B,” unless it is clear from the context or the foregoing description that only one of A and B is intended. Further, the recitation of “at least one of A, B and C” should be interpreted as one or more of a group of elements consisting of A, B and C, and should not be interpreted as requiring at least one of each of the listed elements A, B and C, regardless of whether A, B and C are related as categories or otherwise. Moreover, the recitation of “A, B and/or C” or “at least one of A, B or C” should be interpreted as including any singular entity from the listed elements, e.g., A, any subset from the listed elements, e.g., A and B, or the entire list of elements A, B, and C.

Claims

1. A home appliance for substance processing using microwave, comprising: a temperature sensor; a microwave generator configured to generate microwave; a main body providing a chamber with a side opening, wherein the microwave generator is situated beneath the chamber, and the substance is placed inside the chamber during process; a door fixed on a first side frame of the main body, wherein the door can be closed to cover the side opening of the chamber in the main body; a waveguide integrated in a rear frame of the main body, the waveguide being connected to the microwave generator and configured to direct the microwaves into the chamber through an output port located at a rear surface of the chamber; and a weighing sensor integrated in the main body; a motor situated beneath the chamber and proximate to a bottom surface of the chamber; and a controller coupled to the temperature sensor and the microwave generator and configured to control an operation of the microwave generator based on a measurement of the temperature sensor for processing the substance, wherein the temperature sensor is removably attachable to a first side surface of the chamber, and the first side surface of the chamber is an interior surface of the first side frame of the main body, wherein the controller is integrated in the main body and configured to: obtain measurements from the weighing sensor and the temperature sensor; and adjust, based on the measurements, the operation of the microwave generator, wherein the motor is configured to drive a rotor when the rotor is placed inside the chamber, and wherein the controller is further configured to adjust, based on the measurements, a rotational speed of the rotor through the motor.
2. The home appliance according to claim 1, further comprising: a weighing sensor coupled to the controller, wherein the controller is further configured to control an operation of the microwave generator based on a measurement of the weighing sensor for processing the substance.
3. The home appliance according to claim 2, further comprising: a motor coupled to the controller and configured to drive a rotor placed inside the substance, wherein the controller is further

configured to adjust, based on at least one of the measurement of the weighing sensor and the measurement of the temperature sensor, a rotational speed of the rotor through the motor.

4. The home appliance according to claim 1, further comprising: one or more cooling fans adjacent to the microwave generator and configured to dissipate heat from the microwave generator.

5. The home appliance according to claim 1, further comprising: a two-step door locking mechanism integrated in a second side frame of the main body, wherein the second side frame and the first side frame are on opposite sides of the main body.

6. The home appliance according to claim 1, wherein the weighing sensor is integrated in a top frame of the main body.

7. The home appliance according to claim 1, wherein the controller further comprises: one or more processors: a memory storing instructions executable by the one or more processors; and a transceiver configured to receive parameter models associated with one or more recipes, wherein the memory is configured to store the parameter models associated with one or more recipes, and wherein the one or more processors are configured to: determine, for the substance, a set of parameters corresponding to a parameter model associated with a recipe of the one or more recipes; and determine, based on the measurements, an adjustment to one or more parameters in the set of parameters for processing the substance.

8. The home appliance according to claim 1, wherein the main body comprises an opening in a top frame, the opening serves as a channel, allowing air communication between inside and outside the chamber, and wherein the opening does not allow the microwaves to pass through.

9. The home appliance according to claim 8, further comprising: a condenser connected to the main body through the opening, wherein the condenser is configured to collect steam from the chamber.
