Extraction device

Essential oils and aromatic waters

A-General description

The aim of this device is to extract essential oil and aromatic water from various plant matrices using a household microwave.

The device comprises a 100 mL reactor, a Vigreux column to cool the vapors generated, and a small receiving reactor to collect the essential oil and aromatic water.

This device is preferably used with fresh plant matrices (10 to 40 g), but it can also be used with dry plant matrices (5 to 20 g) with the addition of extrinsic water (15 to 30 mL).

B- Risks associated with use of the device

Read these instructions carefully before use

- Risk of burns: Allow device to cool for 10 minutes before removing from microwave.
- Flammable risk: Failure to control microwave power and heating time can burn the plant matrix. If the plant matrix no longer contains water, the temperature may rise above 100°C. This may result in the release of fumes.
- This device must not be used in a conventional oven.
- Please note that this device may only be used for experimental and educational purposes.

C- Example 1: Citrus fruit extraction

C-1 Description of the experiment

■ Use fresh or ripe citrus fruit.
■ Grate the citrus peel (zest) to obtain a very finely grated peel (fig 1). Introduce between 20 and 40 g of freshly grated peel into the 100 mL reactor. Assemble the device (fig 3) + fit the three safety clamps.
■ Heat at 100 W for 15 minutes and leave the glass device to cool for 10 minutes (Reminder: risk of burns).
■ Dismantle the device. Using a plastic pipette, remove the water + essential oil mixture and transfer to a hemolysis tube.
■ You'll observe two phases: the essential oil at the top of the tube and the aromatic plant water at the bottom (figs. 4 and 5).
■ Using a pipette, gently separate the essential oil from the water (fig 6).
■ Depending on the citrus fruit used, its variety, freshness and operating conditions, you will obtain 2 to 3 mL of aromatic water and 0.2 to 1 mL of essential oil.


fig 1


fig 2


fig 3

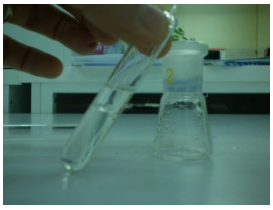
fig 4


fig 5

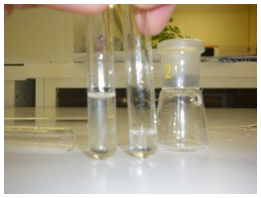
fig 6

C-2.Additional scientific information

■ You can vary the operating conditions, such as the extraction time, the power applied and the amount of bark introduced:
- 30 g bark, 100 W, 20 minutes
- 30 g bark, 100 W, 12 minutes
- 20 g bark, 100 W, 10 minutes
- 30 g bark, 180 W, 5 minutes
- 30 g bark, 300 W, 2 minutes
-...

You can compare the quantities of essential oil and aromatic water obtained and determine the optimum conditions.
■ You can collect several essential oil extracts in a single hemolysis tube and add a small amount of

orange peel to the tube. Close with a stopper, shake and wait a few minutes. You'll notice that the initially transparent essential oil has turned orange.

Explanation: The essential oil of citrus fruits (particularly oranges) contains a major compound (limonene) which is a solvent that solubilizes the colorants contained in the citrus peel. The distillation of citrus peel yields a biosourced degreasing solvent.

D- Example 2: Extraction from various fresh herbs

D-1 Description of the experiment

■ You can use a wide range of fresh aromatic plant matrices: parsley, basil, rosemary, sage, peppermint, thyme, chives, garlic, onion, shallot...

■ Introduce between 20 and 40 g of fresh matrices cut into small pieces into the 100 mL reactor. Assemble the device + fit the three safety clamps.

■ Heat at 100 W for 15 minutes and leave the glass device to cool for 10 minutes (Reminder: risk of burns).

■ Dismantle the device. Pipette the extract obtained into the receiving reactor.

■ This extract will contain mainly aromatic water, with a few drops of essential oil.

D-2. Additional scientific information

■ As with citrus, you can vary the operating conditions to see the impact on the volume of extract obtained.

■ This aromatic water comes from the distillation of the plant's constitutive water. The volatile compounds present in the plant are carried away by the passage to the water vapor state.

■ This aromatic water could be used in food or cosmetic preparations.

F- Example 3: Extraction from various matrices

F-1 Description of the experiment

■ You can use a wide range of fresh plant matrices: strawberries, apples, pears, raspberries, flowers, etc.

■ Introduce between 20 and 40 g of chopped fresh matrices into the 100 mL reactor. Assemble the device + fit the three safety clamps.

■ Heat at 100 W for 15 minutes and leave the glass device to cool for 10 minutes (Reminder: risk of burns).

■ Dismantle the device. Pipette the extract obtained into the receiving reactor.

■ This extract will contain aromatic water only.

F-2. Additional scientific information

■ As with citrus fruit, you can vary the operating conditions to see the impact on the volume of extract obtained.

■ This aromatic water could be used in food or cosmetic preparations.

G- Example 4: Extraction from dry aromatics

G-1. Experiment description

■ Use finely ground dry herbs (mortar, coffee grinder).

■ The list of dry aromatics can be very varied: star anise, cinnamon, pepper, pink berries, rosemary, thyme, etc.

■ Introduce between 5 and 20 g of crushed dry matrices with an addition of extrinsic water (15 to 30 mL) into the 100 mL reactor. Assemble the device + fit the three safety clamps.

■ Heat at 100 W for 15 minutes and leave the glass device to cool for 10 minutes (Reminder: risk of burns).

■ Dismantle the device. Pipette the extract obtained into the receiving reactor.

■ This extract will contain mainly aromatic water, with a few drops of essential oil.

G-2. Scientific details

■ As in the case of citrus fruits, you can vary the operating conditions to see the impact on the volume of extract obtained.

■ This aromatic water is called hydrolat or floral water (for that obtained with flowers).

■ This aromatic water could be used in food or cosmetic preparations.