Container characteristics during drying and concentration

ES-001

【Keyword】concentration, drying　Containers　Smart Evaporator

Introduction

By using “Smart Evaporator (Fig.1)", it is possible to concentrate and dry the samples by the patented VVC method (Fig.2) after the sample is fractionated.

・In the VVC method, it is known that the state of the sample after concentration drying differs depending on the shape of the container. So here we report the comparison result of the characteristics found on two methods using a flat-bottom container and a tapered-bottom container of almost the same volume.

Fig. 1 Smart Evaporator

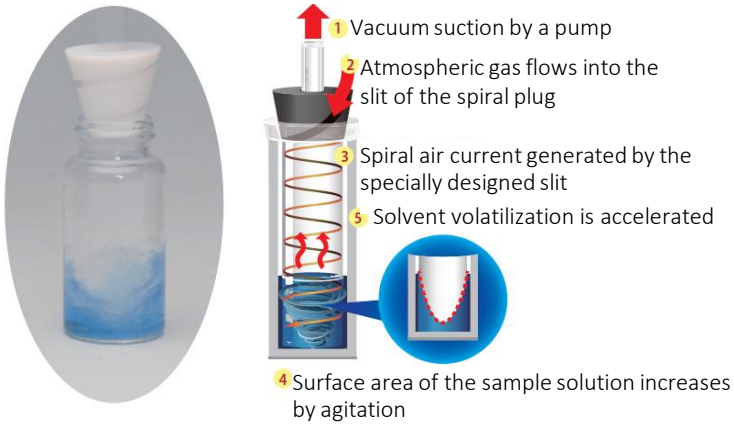

Fig. 2 Mechanism of VVC method

Samples

・Riboflavin (aqueous solution, methanol solution)

Experiment

・ 10 mL of the sample was placed each in a 50 mL flat-bottom container and a 50 mL tapered-bottom container and concentrated to dryness by the VVC method (heater temperature: 50 ℃).

・The suction volume rate of the vacuum pump was set to about the upper limit of the range in which the sample liquid level did not scatter during stirring, and the sample was dried at a constant suction volume rate.

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Results

<Aqueous solution (Fig.3)>

・In the flat-bottom container, the sample was scattered at the bottom of the container while drying. This is a phenomenon that occurs not because the droplets are scattered on the wall surface from beginning to end in the concentration process, but when the concentration is advanced and the amount of the liquid is reduced, the liquid surface will not be agitated smoothly and the sample solution will be scattered on the wall surface.

On the other hand, in the tapered-bottom container, the sample was concentrated and dried focusing at the lower part of the container bottom, and it was confirmed that the sample solution did not scatter even when the amount of liquid decreased.

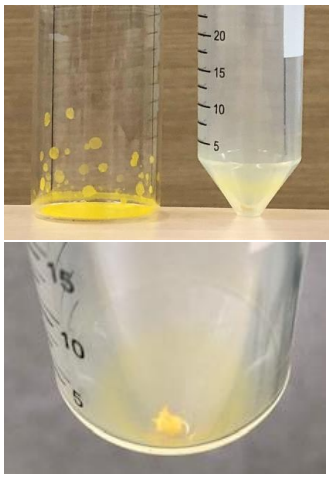

Fig. 3 After drying the aqueous solution

<Methanol solution (Fig.4)>

・In the flat-bottom container, as same as the aqueous solution, the sample was dried in a state of being scattered at the bottom of the container. On the other hand, regarding the tapered-bottom container, it was confirmed that the sample was concentrated and dried in the lower part of the container as in the case of the aqueous solution. However, the degree of focusing was lower than that of the aqueous solution, which is considered to be due to factors such as vaporization rate and surface tension.

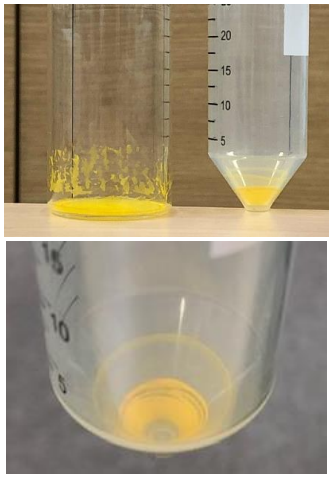

Fig. 4 After drying the methanol solution

Summary

Based on the results of this study, the comparison results of flat-bottom containers and tapered-bottom containers are summarized as follows.

Container Shape	Sample splatter on drying *)	Drying speed **)	Remarks
Flat-bottom	Yes	Aqueous solution: 40 minutes Methanol solution: 1.5 hours	It will splatter at the bottom of the container, but as the rate of drying and solidification is fast, it is suitable for **solvent replacement**.
Tapered-bottom	None	Aqueous solution: 4.5 hours Methanol solution: 3.5 hours	Drying speed is inferior to the flat-bottom type, but as the sample is concentrated and dried focusing to the lower part of the container bottom, it is suitable for **sample isolation**.

(*) It is possible to dry the sample without scattering it by lowering the suction volume rate of the vacuum pump and gently agitating the surface of the liquid (the drying time will be longer).

(**) Time required for drying and solidification under the conditions shown on the right (liquid volume: 10 mL, room humidity: about 40% RH, heater temperature: 50°C)