

# Smart Evaporator -Verification of Enzyme Activity-

## Abstract

The activity of papain solution was measured after it was concentrated by Smart Evaporator C1 or nitrogen blowdown concentrator and redissolved. The results showed that the enzyme activity of the sample concentrated by Smart Evaporator C1 was as high as or higher than that concentrated by the nitrogen blowdown. It was also found that the concentration speed with Smart Evaporator C1 was about three times faster than that of the nitrogen blowdown.

## Experiment

50 mg/L of papain solution in a 20 mL vial was concentrated by Smart Evaporator C1 (with Spiral Plug "for Water") or by nitrogen blowdown under the conditions shown in Table 1. Next to the concentration process, the sample was redissolved in pure water, then the enzyme activation solution and the substrate solution (casein solution) were added for reaction. After quiet standing for a certain time, trichloroacetic acid solution was added to stop the reaction. The coagulated protein was precipitated by centrifugation, and absorbance of the supernatant (280 nm) was measured using an absorption spectrometer to determine the enzyme activity\*.

\* The more peptides and amino acids are produced by the degradation of casein by papain, the absorbance be greater.

	1	2	3	4	5
Concentration method	None	Nitrogen blown	Smart Evaporator C1 (with Spiral Plug "for Water")		
Conditions	-		Nitrogen flow	Nitrogen circulation	Atmospheric circulation
Flow rate	None	5L/min	10L/min	10L/min	10L/min

Table 1: Sample preparation conditions



**Spiral Plug  
"for Water"**

Spiral Plug "for Water":

Made with fluoroelastomer\* (regular type is with PTFE) for better fitting to the container mouth enabling faster evaporation of water

\* the material is not durable against some solvents

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## Results

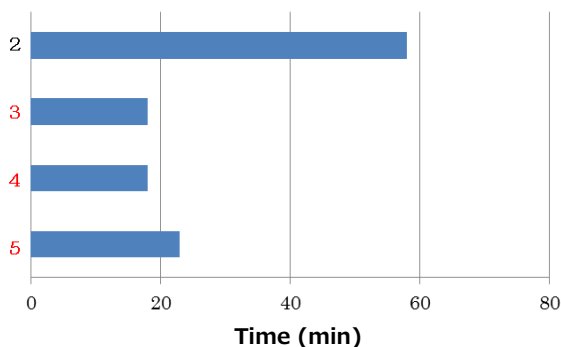
### 1. Concentration speed by each concentration method

Concentration was achieved at the rate shown in Fig. 1. It was found that the time required for concentration by the Smart Evaporator C1 was reduced to about 1/3 of that by the nitrogen blowdown.

### 2. Effect of each concentration method on enzyme activity

The enzyme activities of the samples after concentration by each concentration method are shown in Fig. 2. The enzyme activity of the sample concentrated by Smart Evaporator C1 was as high as or higher than the sample concentrated by the nitrogen blowdown. These results suggest that the Smart Evaporator C1 is effective for the concentration of protein solutions, which will lead to improved research efficiency.

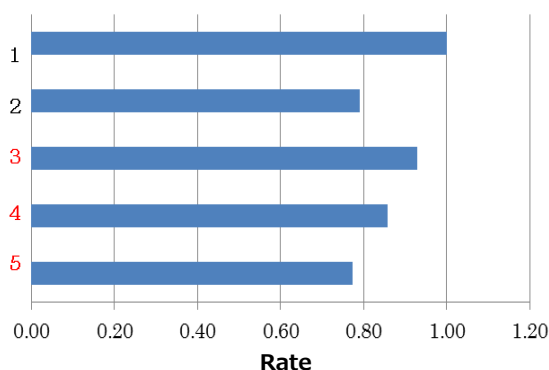
[Fig. 1] Time required to dry solidification



Sample: 50mg/L papain solution (solvent: water),  
Container: 20mL vial, Solvent volume: 1 ml, Heating: None.

Concentration method /  
2. nitrogen blowdown,  
3. Smart Evaporator C1 nitrogen flow,  
4. Smart Evaporator C1 nitrogen circulation,  
5. Smart Evaporator C1 atmospheric circulation

[Fig. 2] Effect of each concentration method on enzyme activity



Ratio of absorbance value (OD280) when that without concentration (1) is set to 1

Concentration method /  
1. None,  
2. Nitrogen blowdown,  
3. Smart Evaporator C1 nitrogen flow,  
4. Smart Evaporator C1 nitrogen circulation,  
5. Smart Evaporator C1 atmospheric circulation