

A Simple Freeze Dryer for Dehydration of Roses

S.H. Hashemabadi, F. Aghili, F. Shams

Computational Fluid Dynamics Research Laboratory, Department of Chemical Engineering, Iran University of Science and Technology, Narmak, Tehran, 16846, E-mail: hashemabadi@iust.ac.ir

1. Summary

In this work, with a simple freeze dryer has been reported drying curve of roses. Powdered dry ice which has $-78.5\text{ }^{\circ}\text{C}$ sublimation temperature, has been used for freezing cycles and vacuum oven as freeze drying chamber. During the process, the pressure of chamber has been kept below the triple point of water ($< 0.01\text{ atm}$). Primary and secondary stages of drying for two samples of roses in drying curve have been specified. The results show in constant drying condition, sample weight affects the drying curve and in constant chamber pressure, increasing of temperature decreases the drying time.

Keywords: freeze dryer, dry ice, rose, drying curve

2. Extended Abstract

2.1 Experimental apparatus

In the present method, a simple freeze dryer has been used for drying of rose flowers. Basically, this apparatus is a vacuum oven EV-018 model, in which there is only one chamber for both freezing and sublimation stages. Figure 1 shows a schematic of the freeze dryer used in this work.

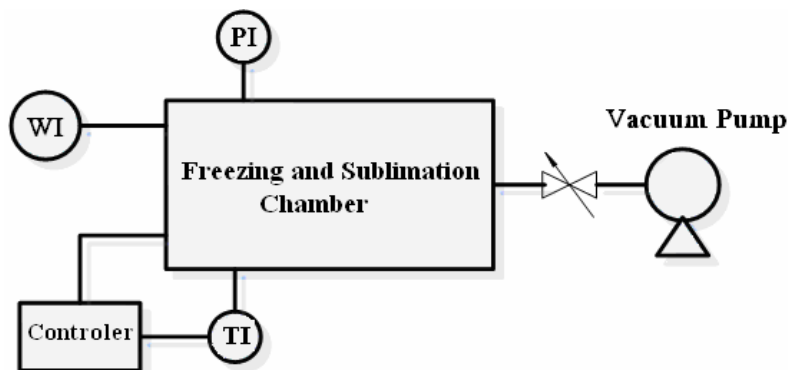


Fig. 1 Simple schematic of freeze dryer

Powdered dry ice which in the atmospheric pressure is sublimated at the temperature of -78.5°C has been used as coolant media in dryer (Horigane 2003).

2.2 Discussion and analysis of the results

Figure 2 shows the decrease in the moisture content of samples A and B. The initial weights of A and B samples are 17 kg and 8 gr. respectively. In this figure, it is clear that the drying rate is low and in the beginning of the process and it increases with time. The low rate of the drying in the beginning of the process is because of the mass transfer resistance resulting from the porosity of the flower. The decrease in the moisture content will be continued until a specific in which the changes in the moisture content become constant. Here, the primary stage of the drying in which the frozen free moisture is sublimated, is finished and in order to start the secondary stage (Oetjen and Haseley 2004), we should increase the chamber temperature. In this stage, the bounded moisture of the flower tissue is omitted.

2.3 Results

In the present work, with making a simple freeze dryer in the experimental scale, freeze drying of rose flower has been studied. Powdered dry ice has been used for freezing of the moisture of the flower, and a vacuum oven has been used for sublimation of frozen water. In addition to the temperature of content, the vacuum pump can make vacuum pressure (below 0.01 atm) in the chamber. The drying curve of two samples of flowers has been reported. Primary and secondary stages of drying for two samples of roses in the drying have been specific. Using this simple plan of freeze dryer, we can consider the effects of different factors.

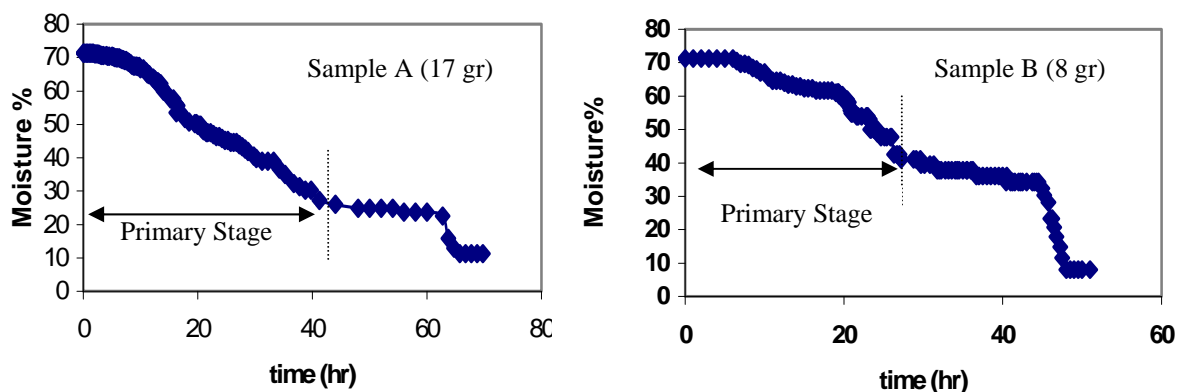


Fig. 2 The moisture variation with time for two samples of rose

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