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DVS Application Note 28

Water Pickup in Monosodium Glutamate

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The Application note describes the use of DVS to characterise the stability of flavour delivery system.

Introduction

The water uptake in flavour delivery systems is key to their performance. Monosodium glutamate (MSG) is widely used in hot, humid Asian countries where flavour enhancers can become extremely unstable. The Dynamic Vapour Sorption (DVS) machine is designed to undertake real time measurements on the kinetics of water sorption of food products. This encompasses the typical heat and humidity conditions for storage of food materials and will give directions to product developers in their search for greater product stability.

Method

The samples were analysed on a DVS Advantage automated vapour sorption instrument at 25ºC. The samples were initially dried for 3 hours under a continuous flow of air to establish the dry mass. The relative humidity was increased from 0% to 90% RH and then decreased in a similar manner.

Results

Typical water sorption data for Japanese MSG are shown in Figure 1. In Figure 1, the blue line indicates the requested relative humidity and the red line shows the percentage changes in mass due to the gain or loss of water.

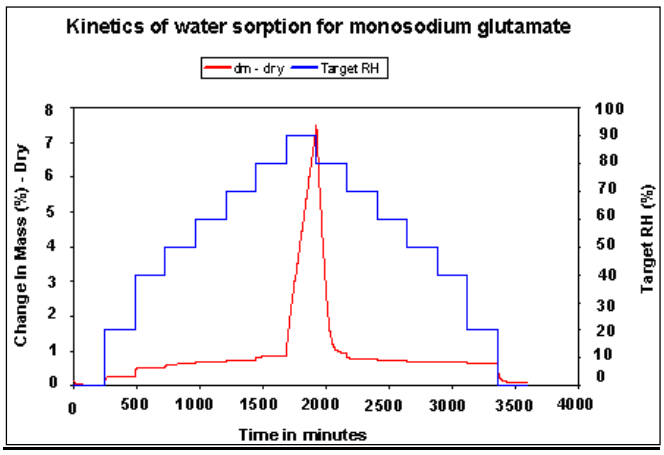

Figure 1. Kinetics of water vapour sorption for monosodium glutamate at 25 ℃

The kinetics of moisture sorption are well illustrated by this type of test. At relative humidities of 70% and below, the MSG takes up small amounts of moisture, below 1%. However, 80% RH is a critical level: the percentage weight gain surges as the monosodium glutamate starts to deliquesce. This is indicated by the sharp spike in the data at 80% RH. This is a typical result for a crystalline material. However, the four-hour exposure to 80% RH at 25°C is insufficient to cause substantial product deterioration and the water is rapidly lost during desorption.

Water sorption isotherms are plotted in Figure 2

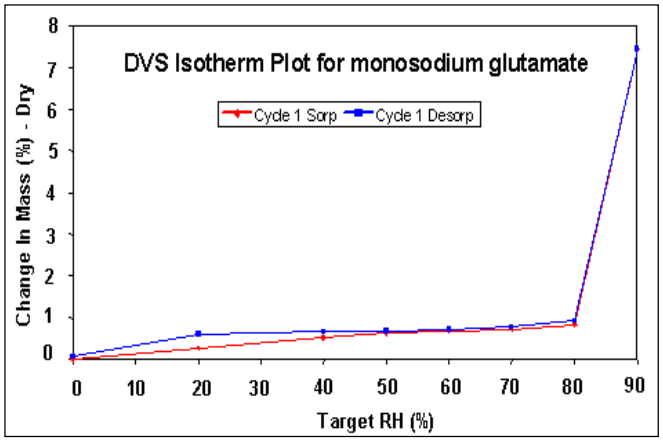

Figure 2. Water sorption isotherms for monosodium glutamate at 25°C

The main feature present in Figure two is the confirmation of the rapid uptake of water past 80% RH. The red line shows the water sorption data, the blue line shows the desorption data. There is some hysteresis between the two since the water is released more slowly than it is sorbed.

An additional option offered with the DVS is the video camera. This can be positioned below the sample and the physical state of the product monitored during the water sorption and desorption cycles. An example of video microscopy output is shown in Figure 3.

Figure 3. Video microscopy output on monosodium glutamate at 0%RH and 25°C.

The intact nature of the MSG can be seen in this photograph. The shape of the product did not change at the higher humidities tested in this application note but higher humidities would very likely have led to substantial product degradation.

Conclusion

This short study on the stability of Japanese monosodium glutamate shows how the DVS can be used to characterise the stability of this type of flavour delivery system. The water sorption results are interesting in their own right but can also be used to measure the crystallinity or perhaps even the purity of the monosodium glutamate.

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