Water Vapor Permeability Analysis of Food Wrapping Film Using TGA-51

Introduction
Wrapping film that is used for wrapping food ingredients and prepared dishes consists of plastic film material about 10 μm thick, is transparent, lightweight, and flexible, and possesses good heat and water resistance. Food wrapping film has been on the market for about 50 years and it has become a necessity of life for the purpose of covering foods being heated in microwave ovens. The degree to which food wrapping film can keep in moisture, in other words, the film’s moisture barrier performance, is an important parameter in comparing characteristics of food wrapping films.

Here we used the TGA-51, an instrument capable of continuously measuring water vapor permeability relatively quickly, to measure this property in 5 types of commercially available food wrapping films.

Measurement of Water Vapor Permeability
There are various methods of measuring water vapor permeability. For example, one straightforward method is to remove a piece of food wrap after a given period of time, and then obtain the before-and-after weight difference using an analytical balance. This type of method, however, is non-continuous, therefore requiring a great deal of time to conduct measurements.

Compared to these other methods, TGA allows:
1. Measurement of small samples (as small as 10 mm in diameter)
2. Consistent measurement of relative humidity
3. Continuous measurement of transmitted moisture
4. Measurement in relatively short time period

Measurement by TGA is conducted using a sample cell designed specifically for making water vapor measurements, with the results being detected as weight loss.

The composition of the sample cell (Fig. 3) used here for the vapor permeability measurements consists of a glass vessel for holding an inorganic salt solution, and a packing seal, o-ring and clasp for sealing the sample and glass vessel.
**Measurement of Water Vapor Permeability of Food Wrapping Film Using TGA-51**

Fig. 4 to Fig. 9 show the weight loss using 5 types of commercially available food wrapping films at 75% relative humidity, and a temperature of 50 °C for a period of 60 minutes. It is clear from the measurements that the less weight loss occurs, the better the moisture is retained, which indicates a better capability of preventing the drying of wrapped food. In other words a lower water vapor permeability of the wrapping film. The figures in parentheses indicate the thickness of the films measured in this experiment.

![Fig. 4 TG Curve of Wrapping Film 1](image1)

![Fig. 5 TG Curve of Wrapping Film 2](image2)

![Fig. 6 TG Curve of Wrapping Film 3](image3)

![Fig. 7 TG Curve of Wrapping Film 4](image4)

![Fig. 8 TG Curve of Wrapping Film 5](image5)

![Fig. 9 Multi View of TG Curves](image6)