

# Application News

Thermal Analysis

No.T144

## Determination of Asbestos Content in Natural Brucite

Natural minerals used for making construction materials may contain asbestos, the content of which must be strictly controlled according to safety regulations.

On August 28, 2006, "The Japan Ministry of Health, Labour and Welfare notification No. 0828002: Determination of Asbestos Contents in Natural Minerals" was issued in Japan as the analytical method to evaluate whether or not asbestos content in specific natural minerals is greater than 0.1 wt%. Those minerals include powdered talc, meerschaum, vermiculite and natural brucite. Here we demonstrate that asbestos content can be assessed using the Shimadzu DTG-60 according to the above method.



Fig. 1 Simultaneous TG/DTA: DTG-60 / DTG-60H

### ■ Determination of Asbestos Content in Natural Brucite

According to the above method, of the four types of natural minerals (powdered talc, meerschaum, vermiculite and natural brucite), natural brucite is must be analyzed by thermal analysis. The other minerals are to be analyzed using an X-ray diffractometer. (Analysis by X-ray diffractometer is not discussed here.)

#### (1) Sample Preparation

Preparation is conducted as follows for both X-ray diffraction analysis and Differential-TG analysis.

1. Crush the brucite using a mortar.
2. Transfer about 5 g of the ground brucite sample to a beaker containing 200 mL of 20% citric acid, and stir for about 1 hour to dissolve the brucite.
3. After dissolution, filter the beaker contents through a 1  $\mu$ m membrane filter to recover the un-dissolved remaining sample. Then, dry at 105 °C for 2 hours, and keep it for analysis.

#### (2) Analysis Procedure

1. For X-ray diffraction analysis, set the X-ray diffraction measurement conditions as appropriate. (Omitted here)
2. Next, set the appropriate conditions for analysis by the thermal analyzer. Conduct qualitative analysis on about 20 mg of the un-dissolved sample, and confirm the peak in the Differential-TG curve that indicates the existence of chrysotile. (Chrysotile is the major crystal format of asbestos.)
3. Below are the measurement conditions for the X-ray diffractometer and DTG-60/60H.
  - ① Measurement Conditions for X-Ray Diffractometer (omitted here.)
  - ② Measurement Conditions for DTG-60/60H

|                    |  |
|--------------------|--|
| Sample Weight      | : 20 mg (approx.)                                  |
| Temperature        | : Ambient to 1000 °C                               |
| Temperature        | : Rise: 20 °C/min                                  |
| Atmosphere         | : room atmosphere,<br>no purge gas                 |
| Reference Material | : $\alpha$ -Al <sub>2</sub> O <sub>3</sub> (20 mg) |
| Measurement Type   | : Differential-TG                                  |

### (3) Assessment Method

1. If the chrysotile peak cannot be found by qualitative analysis using either the X-ray diffraction method or the Differential-TG method, it can be confirmed that the brucite sample does not contain asbestos greater than 0.1 wt%.
2. If the peak indicating the existence of chrysotile is acknowledged using either the X-ray diffraction method or the Differential-TG method, it can be confirmed that the brucite sample does contain asbestos greater than 0.1 wt%.

#### ■ Differential-TG Measurement of Untreated Natural Brucite

When the sample has not been pretreated, large peaks appear in the vicinities of 440 °C and from 600 to 800 °C. The peak from 600 to 800 °C overlaps the chrysotile peak in the vicinity of 650 °C, making identification difficult.

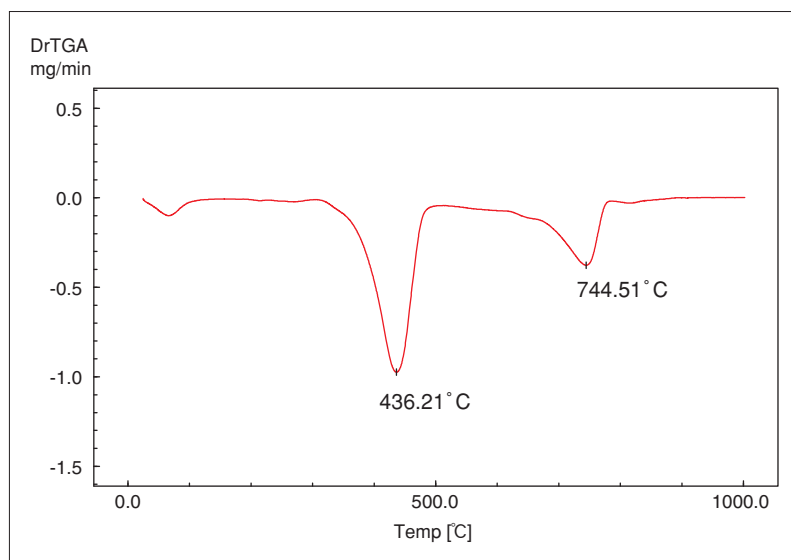


Fig. 2 Measurement of Untreated Natural Brucite

#### ■ Differential-TG Measurement of Treated Natural Brucite

However, after appropriate sample treatment, a peak does appear in the vicinity of 650 °C. A comparison of this peak to that of pure chrysotile (approximately 4 mg or 5 g × 0.1 %) reveals that the two peak temperatures are the same. In addition, the peak area is greater than that of pure chrysotile. Since peak area depends on the amount of chrysotile, this sample is then confirmed to contain asbestos greater than 0.1 wt% according to Assessment Method 2.

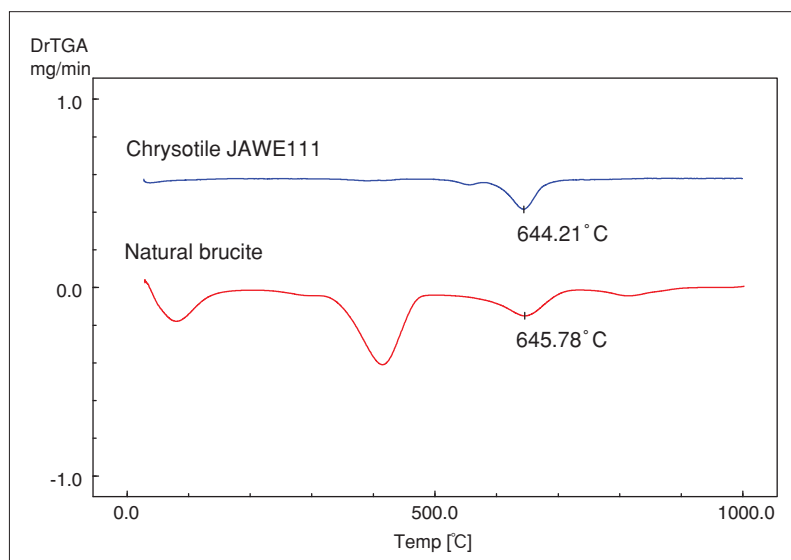


Fig. 3 Measurement of Treated Natural Brucite

#### NOTES:

\*This Application News has been produced and edited using information that was available when the data was acquired for each article. This Application News is subject to revision without prior notice.



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