

Application News

Gas Chromatography

No.G269

Analysis of Methyl Methacrylate in Polymethyl Methacrylate Plastics by GC

Due to the high level of concern for food safety, attention is being focused on residual organic solvents in food packaging. Utensils and food packaging materials are subject to standards controlled through material testing as specified in Japan's "Food Sanitation Act-Specifications and Standards for Food, Food Additives, Etc., Chapter III Apparatus and Containers and Packaging."

■ Overview of Methyl Methacrylate Analysis in Polymethyl Methacrylate Plastics

This standard covers mainly polymethyl methacrylate synthetic resins, in which the base polymer consists of at least 50 % methyl methacrylate. Polymethyl methacrylate is primarily used in table articles due to its high transparency, good weather resistance and excellent machinability.

A separate leachate testing standard is provided for methyl methacrylate, the monomer of polymethyl

polymethyl methacrylate is primarily used in table articles such as chopsticks, cups, soy sauce dispensers, etc. A separate food packaging standard is provided for the monomer methyl methacrylate.

Here we introduce an example of analysis of methyl methacrylate in plastics in which polymethyl methacrylate is the main ingredient.

methacrylate. The methyl methacrylate test method specifies the use of GC/FID to measure the amount of methyl methacrylate that leaches from the sample immersed in a 20 % aqueous ethanol solution.

In the leaching test, the peak area value of methyl methacrylate in the test solution is not to exceed the peak area value obtained from analysis of a 15 µg/mL methyl methacrylate standard solution.

■ Analysis Method

Sample preparation was conducted according to that specified in Japan's "Food Sanitation Act-Specifications and Standards for Food, Food Additives, Etc., Chapter III Apparatus and Containers and Packaging." Commercially available chopsticks made of polymethyl methacrylate synthetic resin were used for the testing. For the leaching test, a piece of a chopstick with a 1 cm² surface area was immersed in 2 mL of 20 % aqueous ethanol solution and maintained at 60 °C for 30 minutes for leaching, and the resulting solution was used as the test solution.

A Restek Rtx-1 capillary column (0.32 mm I.D., 30 m length, 5 µm film thickness) was used, and analysis was conducted by GC/FID.

The preparation procedure is shown in the flow chart of Fig. 1.

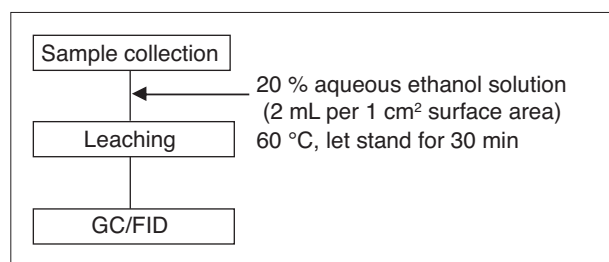


Fig. 1 Preparation of Polymethyl Methacrylate Plastic Sample

■ Analysis of Standard Solution and Sample Solution

Fig. 2 shows the chromatograms obtained from analysis of a methyl methacrylate standard solution (15 µg/mL) and the test solution prepared using a commercially available chopstick made of polymethyl methacrylate synthetic resin.

The peak area value of methyl methacrylate in the chromatogram test solution is clearly smaller than that in the standard solution, which confirms that the test value satisfies the standard criterion.

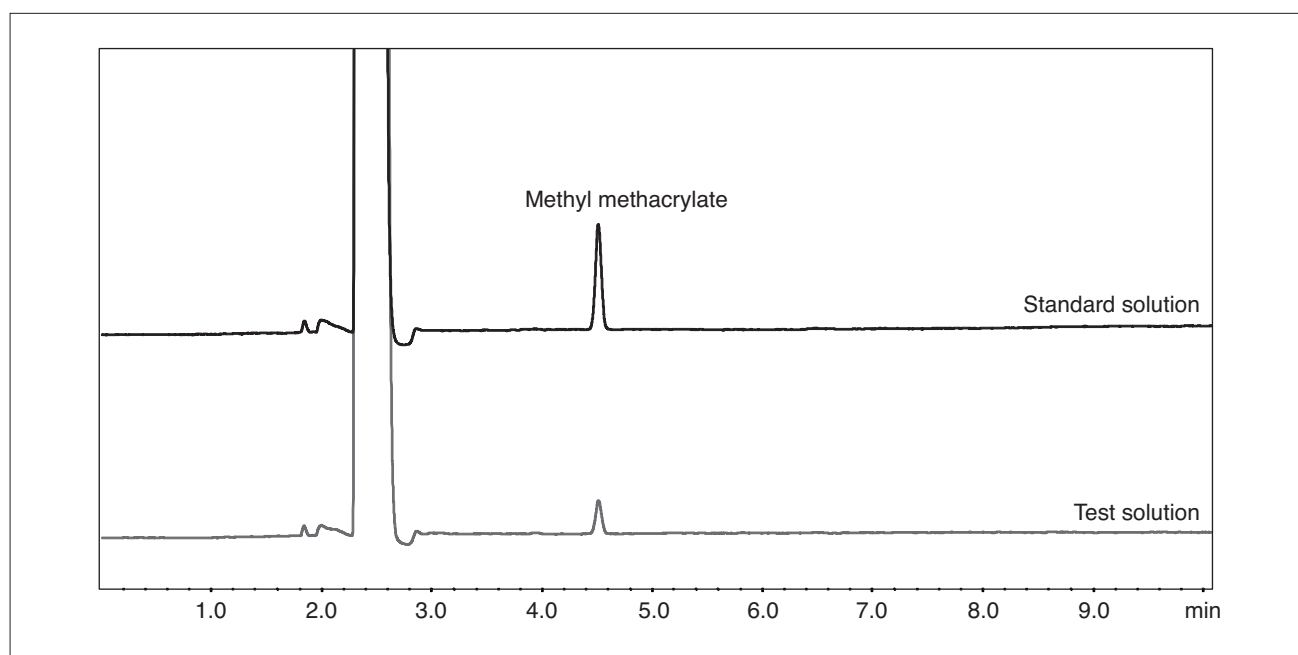


Fig. 2 Chromatograms of Standard Solution (15 µg/mL) and Test Solution

Table 1 Analytical Conditions

Instrument	: GC-2010 Plus AF
Column	: Rtx-1 (30 m × 0.32 mm I.D. df = 5 µm)
Column Temp.	: 120 °C (1min) - 5 °C/min - 170 °C
Injection Temp.	: 200 °C
Carrier Gas	: He 29.5 cm/sec (Constant Linear Velocity Mode)
Injection Method	: Split 1:10
Injection Volume	: 1.0 µL
Detector	: FID
Detector Temp.	: 200 °C

[References]

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Food Sanitation Act (Japanese regulations)—Specifications and Standards for Food, Food Additives, Etc., Chapter III Apparatus and Containers and Packaging



SHIMADZU CORPORATION. International Marketing Division

3. Kanda-Nishikicho 1-chome, Chiyoda-ku, Tokyo 101-8448, Japan Phone: 81(3)3219-5641 Fax: 81(3)3219-5710
Cable Add.: SHIMADZU TOKYO

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