Analysis of Methyl Methacrylate Monomer in Acrylic Denture Base Resin

Poly(methyl methacrylate) is used as a denture base material, and as part of quality control, residual monomer analysis is specified by the Japanese Industrial Standards (JIS). JIS T6501 describes methods based on GC and HPLC. Here, residual methacrylate monomers were measured according to the methods described in JIS T6501 Appendix A.

Figure 1. Analysis of methyl methacrylate monomer (top)
Analysis of acrylic denture base resin (bottom)

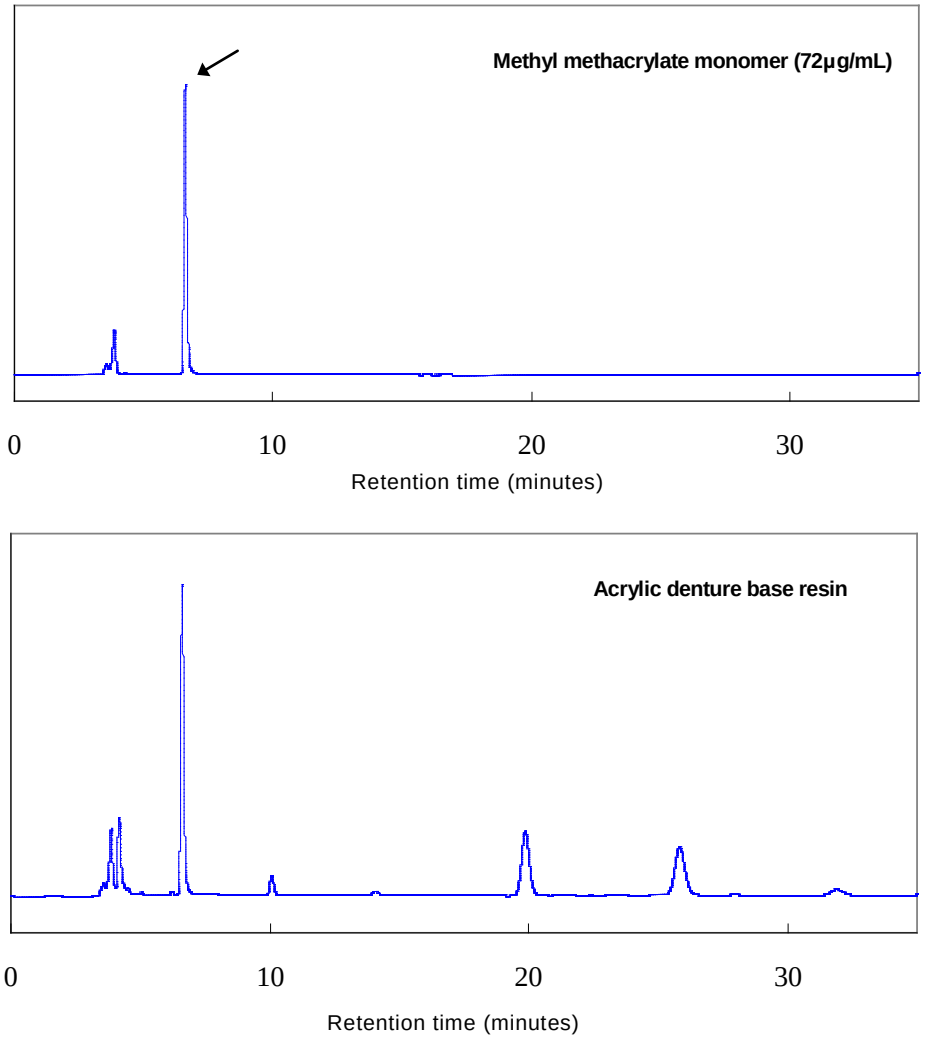


Table 1. Sample preprocessing methods

1. Place about 1 g of crushed sample in a 20mL graduated flask.
2. Add about 18mL of acetone solution*, and while stirring, leave to stand for 72 hours.
3. Add acetone solution* to bring the volume up to 20mL, stir and leave to stand.
4. Take 4mL of the resulting solution in another 20mL graduated flask, and while stirring, add methanol solution** to precipitate polymer components.
5. Use methanol solution** to bring the volume up to 20mL, stir and leave to stand.
6. Remove supernatant and centrifuge.
7. Add methanol to one area of the centrifuged supernatant, and confirm the absence of precipitation to prepare measurement sample.

*Acetone solution: Dissolve 0.02g of hydroquinone in 1L of acetone
**Methanol solution: Dissolve 0.02g of hydroquinone in 1L of acetone

Table 2. Analysis conditions

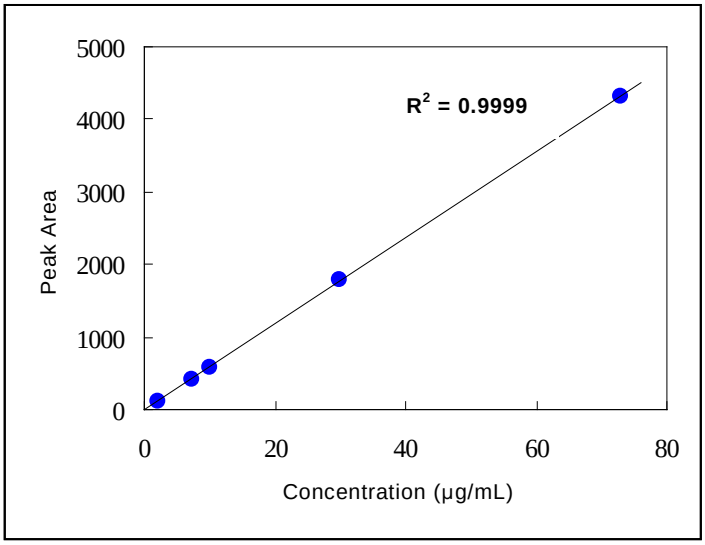
Column:	TSKgel ODS-100V, 5µm, 4.6mm ID x 25cm
Mobile phase:	H_2O/CH_3 = 34/ 66
Flow rate:	0.8mL/min
Detection:	UV@205nm
Temperature:	35°C
Injection vol.:	10µL

Table 1 shows the preprocessing methods for acrylic resins. By altering solubility, polymer components are eliminated.

Figure 1 shows a chromatogram for a standard sample and acrylic resin. Under the same conditions, the retention time for methyl methacrylate monomer was about 6 minutes. Because of the residual oligomer components in the preprocessed solution, analysis time was set at 35 minutes.

Figure 2 shows a calibration curve for standard methyl methacrylate monomer. The calibration curve exhibited favorable linearity with a correlation coefficient of ≥0.999 at a concentration range of several µg/mL.

Figure 2. Calibration curve for methyl methacrylate monomer



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TOSOH Bioscience LLC
3604 Horizon Drive, Suite 100
King of Prussia, PA 19406
Orders & Service: (800) 366-4875
Fax: (610) 272-3028
www.separations.us.tosohbioscience.com
email: info.tbl@tosoh.com