

National Institute of Advanced Industrial Science and Technology

## National Metrology Institute of Japan



## Reference Material Report

NMIJ RM 8158-a

No. +++



## Polystyrene for Raman Spectrometer

This reference material (RM) is produced in accordance with the NMIJ's management system and is in compliance with ISO 17034 and ISO/IEC 17025. This RM is intended for use in the validation of Raman spectrometers.

**Indicative Values**

The indicative values of this RM are given in the table below. The uncertainties of the indicative values are the expanded uncertainty obtained by multiplying the combined standard uncertainty by a coverage factor ( $k$ ) of 2, and it is the half-width of an interval estimated to have a level of confidence of approximately 95 %.

Substance	CAS No.	Indicative value Raman shift (cm <sup>-1</sup> )	Expanded uncertainty Raman shift (cm <sup>-1</sup> )
Polystyrene	9003-53-6	620.7	1.2
		795.1	1.2
		1001.2	1.2
		1031.5	1.2
		1154.9	1.2
		1448.4	1.2
		1582.7	1.2
		1602.1	1.2
		2851.0	1.1
		2906.2	1.2
		3055.1	1.1

**Analysis**

The Raman spectrometer used was equipped with a HeNe laser (wavelength: 632.9908 nm under vacuum) and with reference lamps (Ne and Ar) for the calibration of peak positions. The indicative values of this RM were determined by Raman scattered light and Rayleigh scattered light in wavenumber under vacuum after their peak positions were calibrated by the reference lamps. The peak position was calculated by fitting with the mixed Gaussian–Lorentzian function. It should be noted that each of the peaks at 1448.4 cm<sup>-1</sup>, 2906.2 cm<sup>-1</sup> and 3055.1 cm<sup>-1</sup> was fitted as one bilaterally symmetric peak even though those peaks are bilaterally asymmetric.

**Metrological Traceability**

The indicative values of this RM were determined by the Raman spectrometer calibrated with emission lines of the reference lamps (Ne and Ar). The values and uncertainties of the emission lines in wavenumber under vacuum were quoted from the literatures (E.B. Saloman and Craig J. Sansonetti. *J. Phys. Chem. Ref. Data* 33, 1113–1158, 2004; W. Whaling W.H. Anderson, M.T. Carle, J.W. Brault, H.A. Zarem. *J. Res. Natl. Inst. Stand. Technol.* 107, 149–169, 2002; Craig J. Sansonetti. *J. Res. Natl. Inst. Stand. Technol.* 112, 297–302, 2007).

**Expiration of Report**

This report is valid for one year from the date of shipment, provided that this RM is stored in accordance with the instructions

given in this report.

### Description of the Material

This RM is in the form of a colorless polystyrene disk with mirror-finished surface on one side. Its diameter and thickness are about 25 mm and 4 mm, respectively. The disk is packed in an aluminum-laminated plastic bag with nitrogen gas.

### Instructions for Storage

The RM should be kept in its aluminum-laminated plastic bag at temperatures of 15 °C to 25 °C and protected from light.

### Instructions for Use

The laser should be irradiated on the mirror-finished side of the RM. Foreign materials in or on the RM should be avoided for measurements. The RM should not be handled in direct sunlight.

### Precautions for Handling

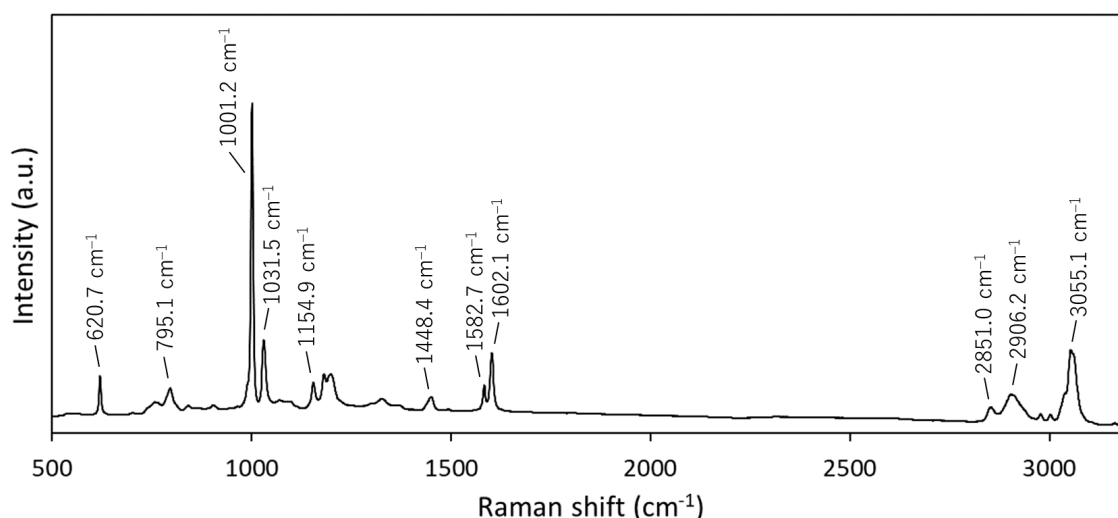
The mirror-finished side of the RM should not be touched directly. Refer to the safety data sheet (SDS) on this RM before use.

### Preparation

The RM was prepared with injection-molding from polystyrene pellets followed by surface processing. Each disk was packed in an aluminum-laminated plastic bag with nitrogen gas.

### Technical Information

A Raman spectrum of the RM obtained under the same spectral resolution as the analysis is shown below, indicating Raman shift at each peak. Characterization was performed at approximately 26 °C.



For this RM, it is recommended to use lasers with wavelength of above 400 nm as fluorescence is observed when lasers with shorter wavelengths are used.

### NMIJ Analysts

The technical manager for this RM is HANARI N. The production manager and the analyst are ITOH N.

### Information

If substantive technical changes occur that affect the certification before the expiration of this report, NMIJ will notify the registered customers. Customer registration on the NMIJ Website (given below) will facilitate notification. Technical reports regarding this RM can be obtained from the contact details given below.

### Reproduction of Report

In reproducing this Report, it should be clearly indicated that the document is a copy.

April 1, 2020

ISHIMURA Kazuhiko

President

National Institute of Advanced Industrial Science and Technology

If you have any questions about this CRM, please contact:  
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Revision history

March 18, 2021: The descriptions on “Analysis” and “Technical Information” were revised.