



DSC and DMA Measurements of Silicone Rubber

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Silicone rubber is a synthetic elastomer primarily composed of silicone. Its elasticity and physical properties depend on the cross-linking method employed and the type and amount of additives used during production. Additionally, its crystalline state depends on the cooling conditions used. These properties can be evaluated through measurement of the glass transition and melting temperatures using thermal analysis, in addition to the crystallinity and elastic modulus.



This report introduces DSC and DMA measurements of silicone rubbers that were slow- and quench-cooled from room temperature to -150 °C.

DSC and DMA Measurement Results



DSC7020
with auto sampler

Measurement conditions

- Sample weight : 10 mg
- Heating rate : 10 °C/min
- Atmosphere : N₂ 30 mL/min
- Sample pan : Al open pan

The glass transition and melting peaks were detected for the slow- and quench-cooled samples at around -125 °C and -47 °C, respectively.

The exothermic peak around -89 °C for the quench-cooled sample corresponds to crystallization, suggesting low crystallinity of this sample.

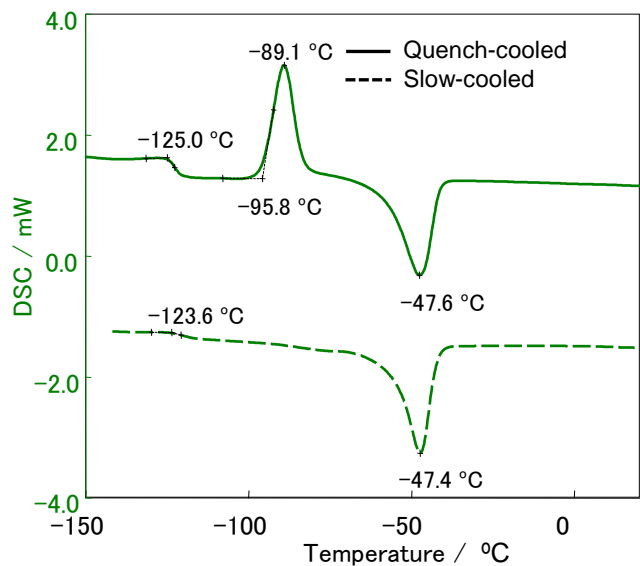


Fig. 1 DSC curves of silicone rubber

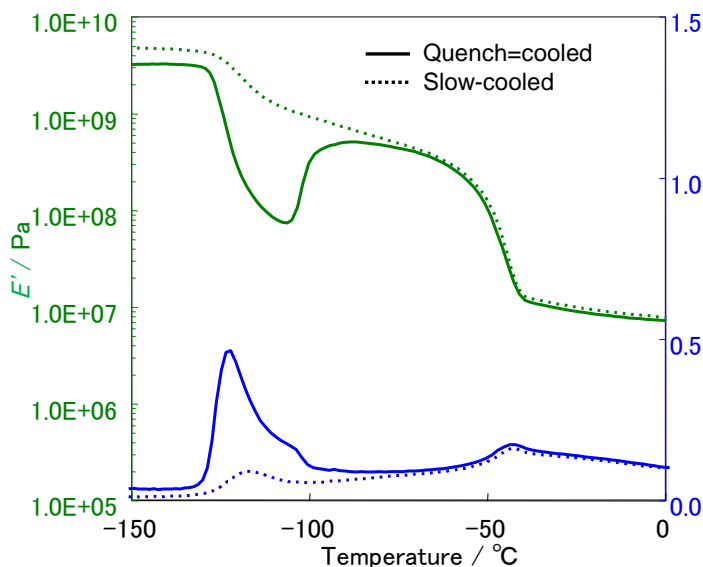


Fig. 2 DMA curves of silicone rubber

The drops in the storage elastic modulus (E') around -125 °C and -50 °C were caused by the glass transition and melting, respectively.

The increase in E' of the quench-cooled sample at -110 °C was due to crystallization. Because of its high crystallinity, E' of the slow-cooled sample is higher than that of the quench-cooled sample below -130 °C.



DMS6100

Measurement condition

- Mode : Tension
- Frequency : 1 Hz
- Heating rate : 2 °C/min
- Sample size : Length 5 mm,
Width 3 mm,
Thickness 2 mm