

S/N ratio comparison of thermograms obtained by Evolved Gas Analysis (EGA-MS) and Thermogravimetry (TG)

[Background] Thermogravimetry (TG) has conventionally been used to investigate the weight changes of polymeric materials as a function of temperature. On the other hand, evolved gas analysis (EGA)-mass spectrometry (MS) using Multi-Shot Pyrolyzer is a simple thermal analysis method in which a polymeric material is continuously heated and the gases released are directly analyzed in real time. This note describes the comparison of the signal/noise (S/N) ratio of the thermograms obtained by these two methods using styrene-butadiene rubber (SBR) as a sample.

[Experimental] In EGA-MS analysis, 0.2 mg of SBR sample in a sample cup was analyzed using the Multi-Shot Pyrolyzer (EGA/PY-303D). In TG measurement, 0.2 mg or 5.0 mg of the sample was placed in a platinum sample pan, and was analyzed using the TG instrument (Rigaku ThermoPlus TG8110, or Shimadzu DTG-50). In TG, the inflection point varies depending of the sample amount; therefore, the smallest amount of sample should be used. However, the sample weight is generally limited to several mg due to the detection limit of the balance.

[Results] Thermograms of SBR obtained by EGA-MS and TG analysis are shown in Fig. 1. The apex temperature of the TG differential curve (DTG) shifted from 467°C for the sample amount of 0.2 mg to 473°C for 5.0 mg, showing 6°C upward shift as a result of increased sample amount. The DTG with 5.0 mg was similar to the EGA thermogram. However, when the noise levels of both thermograms for 0.2 mg are compared, the S/N ratio of the EGA thermogram is found to be 400 times better than that of the DTG. See Technical note PYT-030E for the correlation between TG and EGA-MS using a variety of samples.

References: LCGC 4, 374-378,2002, Amer. Lab., Jan.,32-36,2003, Amer. Lab., Mar,1-3, 2003

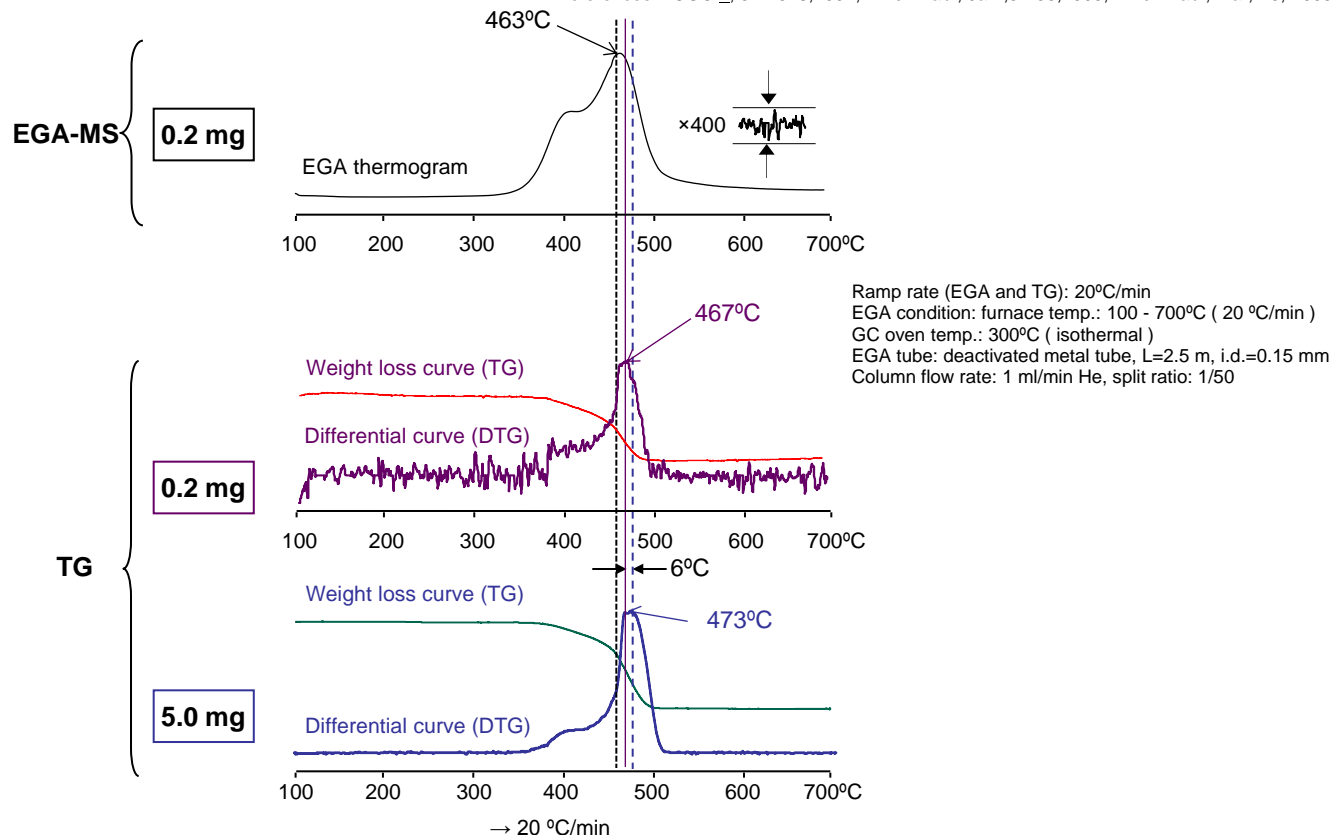


Fig. 1 EGA thermogram and TG weight loss (differential) curves of SBR

Keywords : EGA-MS, thermogravimetry, thermal analysis, differential curve, sample weight

Products used : Multi-functional pyrolyzer, Vent-free GC/MS adapter, Deactivated metal capillary tube

Applications : General polymer analysis

Related technical notes : PYT-007E, PYT-030E

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