

Thermal-decomposition Process Analysis of Sodium Formate Using TG-MS

Product: JMS-Q1500GC GC/MS System

Introduction

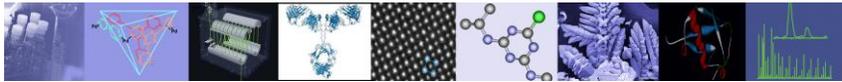
Thermogravimetry (TG) is used to measure weight changes of samples under programmed heat conditions. A system combining thermogravimetry/differential thermal analysis (TG/DTA) with mass spectrometry (MS) can be used for both qualitative and quantitative analysis of gases evolved from the TG furnace into the mass spectrometer. In this application note, we show qualitative analysis of the thermal-decomposition process for sodium formate using the “STA2500 Regulus” TG system (NETZSCH) and the gas chromatography–quadrupole mass spectrometry (GC/QMS) “JMS-Q1500GC” system (JEOL).

Experiment

A 20 mg sample of sodium formate was weighed with an electronic balance and measured by TG-MS. Table 1 shows the TG-MS measurement conditions. Ionization energy was set to 17 eV, which ionized hydrogen, but not the helium used as the atmospheric gas.

Table 1. TG-MS measurement conditions.

TG		MS	
Furnace temp.	60°C → 20°C/min → 1000°C	Ion source temp.	250°C
Transfer line temp.	350°C	Interface temp.	300°C
Atmospheric gas flow	He, 100 mL/min	Ionization mode	EI+: 17 eV, 30µA
Split ratio	100:1	Relative EM voltage	+200V
GC		Measurement mode	SCAN
Oven temp.	350°C	Scan range	m/z 2 – 100
Column	Inactivated fused Silica Capillary tube, 5m x 0.25mm i.d.		



Results

TG-MS measurement results for sodium formate are shown in Figure 1. The TG curve (= weight change), differential thermal-analysis (DTA) curve, and total ion current chromatogram (TICC) are respectively shown as green, blue, and red lines. In the DTA curve, the endothermic reaction was detected at 260°C. This was due to the melting of sodium formate (its melting point is 253°C). In the TG curve, weight loss was detected at 430°C and 570°C, and in the TICC, evolved gas peaks were detected at corresponding temperatures.

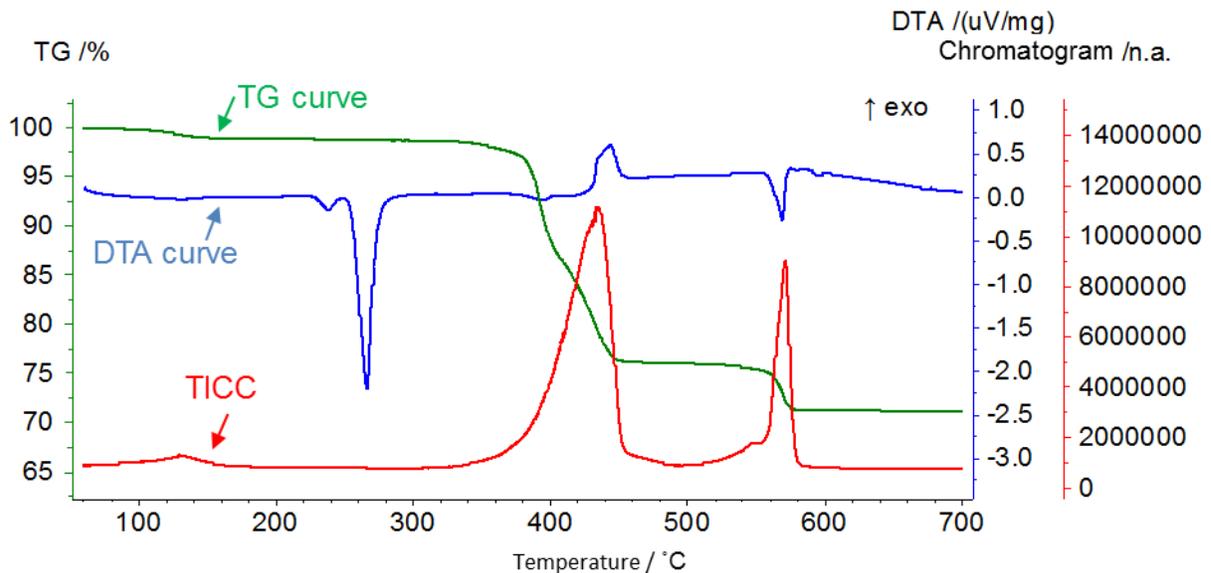


Figure 1. TG, DTA, and TICC curves of sodium formate.

11 Dearborn Road, Peabody, MA 01960
Tel: (978) 535-5900 • Fax: (978) 536-2205
ms@jeol.com • www.jeolusa.com