

Analysis of volatiles released from a UV curable resin using UV/Py-GC/MS technique

[Background] UV curable resins are used in a wide spectrum of applications including microelectronics packaging, adhesives in electronics and optical parts, etc. The curing reaction generates volatile compounds from the resin, which corrode metal surfaces and deteriorate product quality; therefore, there is a need for qualitative and quantitative analysis of such volatiles. Here, a dry film was analyzed by ultraviolet light (UV) irradiation/pyrolysis-GC/MS technique. The dry film used was an acrylic UV curable resin and is used as a mask material for etching process in the electronics packaging.

[Experimental] A small disc-shaped sample (3 mm in diameter, 350 µg) was cut out from a dry film sheet and was used for this experiment. The UV irradiation was conducted in He atmosphere at 60 °C for 10 minutes using a micro UV irradiator (UV-1047Xe) which uses a Xe lamp as a light source. During UV irradiation, volatiles evolved from the sample was cryo-trapped at the head of a separation column that was immersed in liquid nitrogen. When the UV irradiation was finished, the column was removed from the liquid nitrogen then the GC/MS analysis was initiated. For comparison, analysis of volatiles evolved from the resin under an identical condition but without UV irradiation was performed.

[Results] Chromatograms of volatile components released from the resin with and without UV irradiation and their magnified view are shown in Fig. 1. Without UV irradiation, decomposed polymerization initiator was only observed, on the other hand, upon UV irradiation various organic compounds including 300 ppm of methyl methacrylate (MMA) against the original sample weight were observed. As shown here, the UV/Py-GC/MS technique allows you to analyze volatiles released from a UV curable resin during its curing process without complicated treatments.

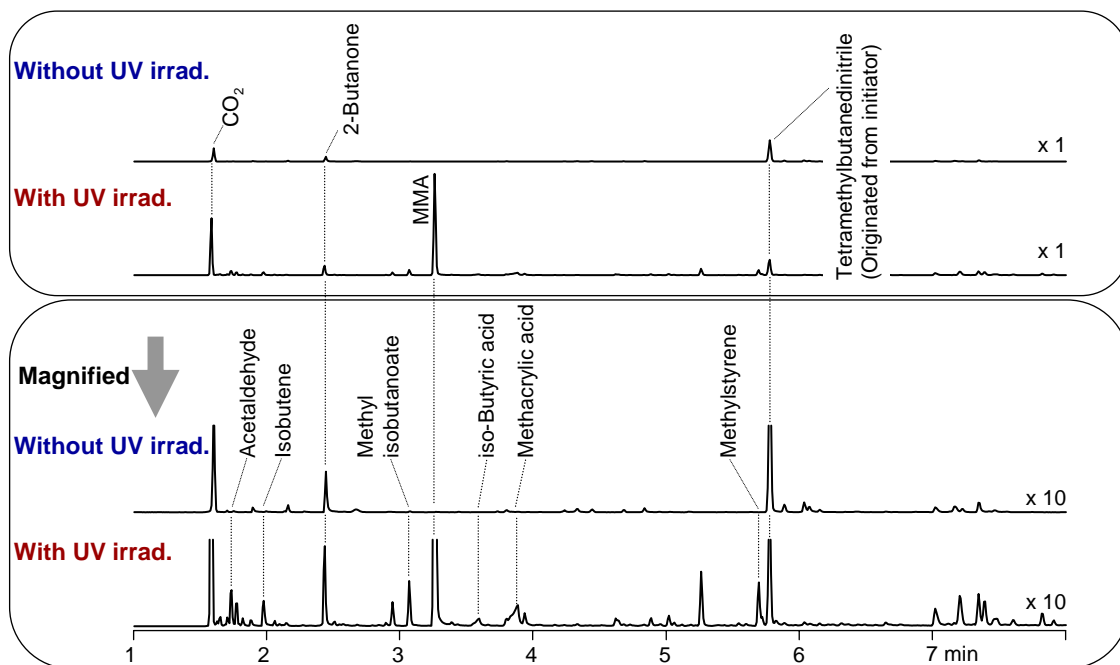


Fig. Analysis of volatiles released from UV curable acrylic dry film

Micro UV irradiator: UV-1047Xe, separation column: Ultra ALLOY⁺-1 (dimethylpolysiloxane, length 30 m, id 0.25 mm, film 0.5 µm), atmosphere gas: He
Column flow rate: 1 ml/min, split ratio: 1/10, sample size: 350 µg (3 mm diameter disc), GC oven temp: 40 ~ 300 °C (20 °C/min)

Keyword : Micro UV irradiator, UV curable resins, dry film

Applications : Semiconductor packaging, Precision instrument

Related technical notes :

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