

[Rapid evaluation of photo, thermal and oxidative degradation of high impact polystyrene by a xenon lamp-based online ultraviolet irradiation-pyrolysis-GC/MS system](#)

T. Yuzawa, C. Watanabe, N. Nemoto, H. Ohtani

Polym. Degrad. Stab. 98 (2013) 671–676

Abstract:

Photo, thermal and oxidative degradation behaviors of high impact polystyrene (HIPS) containing butadiene rubber (BR) were evaluated by online ultraviolet irradiation-pyrolysis (UV/Py)-GC/MS system with a micro-UV irradiator. Volatile degradation products evolved during UV irradiation at 60°C in air were identified and quantified through online GC/MS measurements. Formation of some typical volatiles from the HIPS sample during 1 h irradiation, such as benzaldehyde, acetophenone and benzoic acid originating from PS and 2-propenal from BR, clearly indicates the contribution of oxidative reactions in the polymer chains. Moreover, the residual HIPS samples after irradiation up to 12 h were characterized by evolved gas analysis-mass spectrometry (EGA-MS). The observed EGA thermograms clearly showed not only lower temperature shifts of onset and peak top of gas evolution, but also peak broadening compared with that of the original HIPS sample, reflecting some structural changes in HIPS polymer chains during the irradiation. Furthermore, the degradation behavior of HIPS by the micro-irradiator was compared with that obtained by the conventional accelerated degradation test using a Xe weather meter. The observed EGA profile of HIPS irradiated by the Xe weather meter for 300 h showed the equivalent temperature shift and broadening to that for the residual HIPS after 1 h irradiation by the micro-UV irradiator. This result suggests that the micro-UV irradiator in UV/Py-GC/MS system might achieve the comparable degradation processes of polymeric materials much more rapidly compared with the conventional accelerated degradation test methods.

* Excerpted from online journal website (Click the title)

Frontier Labs products used:

Multi-Shot Pyrolyzer, On-line micro-UV irradiator, UA⁺-5, UATDM-2.5N