

Development of new pyrolysis-GC/MS system incorporated with on-line micro-ultraviolet irradiation for rapid evaluation of photo, thermal, and oxidative degradation of polymers

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ABSTRACT: A new pyrolysis-GC/MS system incorporating with on-line micro-ultra violet (UV) irradiation was developed to make rapid evaluation of the synergistic material deterioration during UV irradiation under thermal and oxidative atmospheres. The basic effectiveness of the system was demonstrated by polystyrene, polypropylene and polycarbonate as the test samples. The volatile products evolved during deterioration of the polymers were analyzed on-line by thermal desorption GC/MS, and then the residual degraded polymers were analyzed by evolved gas analysis (EGA) and/or Py-GC/MS to obtain specific thermograms and pyrograms. Based on these results, the deterioration mechanism of the polymeric materials during irradiation under thermal and oxidative atmosphere can be evaluated using a sub-milligram polymer sample within a relatively short period of time.

KEYWORDS: on-line micro-UV irradiator; pyrolysis-GC/MS; evolved gas analysis; material degradation; polymer deterioration