Evaluation of deterioration degree of exterior wall coatings using Micro UV-Irradiator - Part 2 Correlation between Micro UV-Irradiator and Metal Halide Weather Meter

[Background] Coatings used for exterior surfaces are desired to be chemically and thermally stable and physically durable. Weathering tests are often used to evaluate durability and expected lifespan of a coating; however, weatherability evaluation by natural outdoor exposures to sunlight requires a very long-term testing and it also takes weeks to months even when accelerated weathering is done by a weather meter. A previous report (PYA5-010E) compared two acrylic coatings, one with and the other without UV absorbers and HALS, using Micro-UV Irradiator and evolved gas analysis (EGA)-MS. In this report, the correlation in UV irradiation time between a Micro-UV Irradiator and a metal halide weather meter was examined using the same samples as characterized in PYA5-010E.

[Experimental] Samples were acrylic coatings. Sample A contained UV absorber (Tinuvin 400) and HALS (Tinuvin 292) while Sample B did not contain either of them. Accelerated deterioration of each sample was carried out under air at 60 ºC using Micro-UV Irradiator UV-1047Xe (λ: 280-450 nm, 7000 W/m^2) with a mercury-xenon lamp as a light source and a weather meter with a metal halide lamp (λ: 300-400 nm, 750 W/m^2). The correlation in irradiation time was evaluated by EGA-MS measurements using a He carrier gas.

[Results] Figures 1 and 2 show the EGA thermograms of Samples A and B before and after UV irradiation. Correlation was observed between the changes in the full-width at half-maximum (FWHM) of the EGA thermogram of the samples obtained by the deterioration test using the UV-1047Xe and the metal halide weather meter (Figs. 3 and 4). The results indicate that the evaluation time can be shortened by using Micro-UV Irradiator UV-1047Xe.

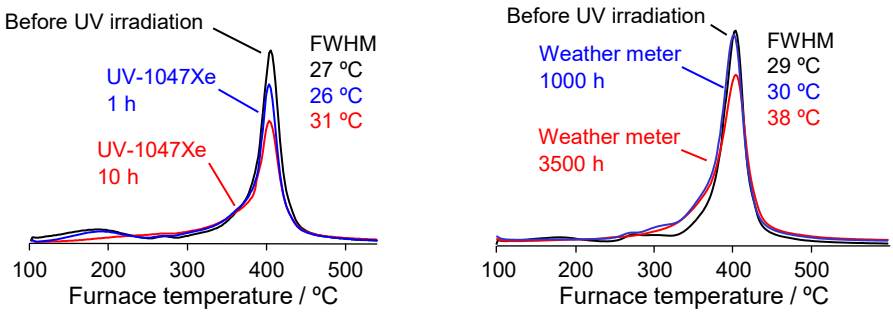

Fig.1 EGA thermograms of Sample A (contains UV absorber and HALS) before and after UV irradiation (Left: UV-1047Xe, Right: Metal halide weather meter)

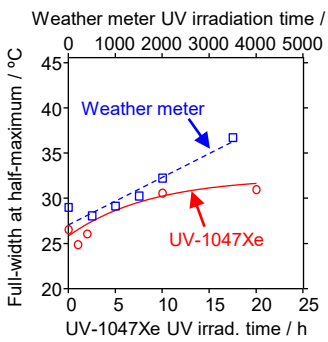

Fig.3 Plots of FWHM vs. UV irradiation time for Sample A

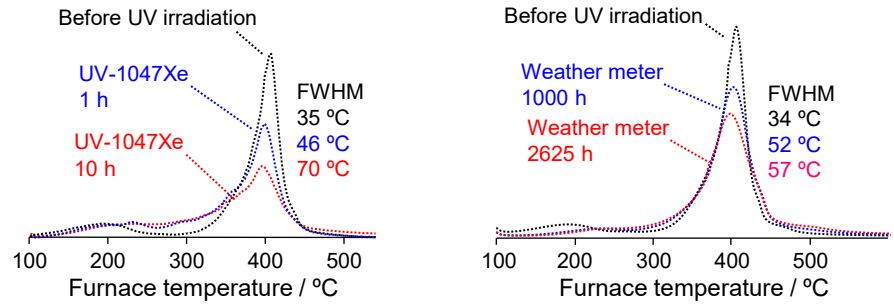

Fig.2 EGA thermograms of Sample B (contains no UV absorber or HALS) before and after UV irradiation (Left: UV-1047Xe, Right: Metal halide weather meter)

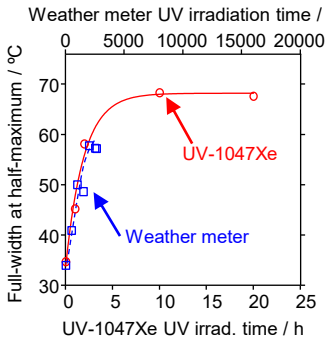

Fig.4 Plots of FWHM vs. UV irradiation time for Sample B

Furnace temp.: 100 – 700 ºC (20 ºC/min), EGA tube: UADTM-2.5N (*L*=2.5 m, i.d.=0.15 mm),
Column flow rate: 1 mL/min (He), Split ratio: 1/50, GC oven temp. : 300 ºC, Sample amount: 0.15 mg

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Keywords : Exterior coating, Acrylic resin, UV absorber, HALS, photo/thermal/oxidative, Metal halide weather meter

Product used : Multi-Shot Pyrolyzer, Micro-UV Irradiator, UADTM-2.5N, Vent-free GC/MS adapter, Side-hole Eco-Cup UV

Applications : Weathering test

Related technical notes : PYA5-004E, PYA5-009E, PYA5-010E

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