

Stray Light Reduction Methodology by a Sinusoidal Light Modulation and Three-Parameter Sine Curve Fitting Algorithm for a Reflectance Spectrometer

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Abstract : In the applications of the spectrometer, the stray light that comes from the environment affects the measurement results a lot. Hence, environment and instrument quality control for the stray reduction is critical for the spectral reflectance measurement. In this paper, a simple and practical method has been developed to correct a spectrometer's response for measurement errors arising from the environment's and instrument's stray light. A sinusoidal modulated light intensity signal was incident on a tested sample, and then the reflected light was collected by the spectrometer. Since a sinusoidal signal modulated the incident light, the reflected light also had a modulated frequency which was the same as the incident signal. Using the three-parameter sine curve fitting algorithm, we can extract the primary reflectance signal from the total measured signal, which contained the primary reflectance signal and the stray light from the environment. The spectra similarity between the extracted spectra by this proposed method with extreme environment stray light is 99.98% similar to the spectra without the environment's stray light. This result shows that we can measure the reflectance spectra without the affection of the environment's stray light.

Keywords : spectrometer, stray light, three-parameter sine curve fitting, spectra extraction

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