Infrared reflectance: independent measurements yield good agreement

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Aronson and Emslie[1] reported extensive measurements of spectral reflectance and emittance of particulate materials in the 7–35-μm region (1400–300 cm^{-1}) by heating the powder samples from below and measuring the normal emitted energy as compared with a blackbody at the same temperature with a Michelson interferometer. Their data were plotted in reflectance ($R = 1 - \epsilon$).

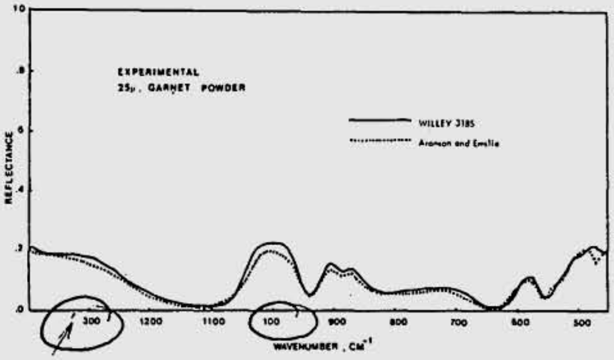

Fig. 1. Experimental reflectance of 25-μm particle size garnet powder obtained by Willey 318S spectrophotometer for comparison with Aronson and Emslie's Fig. 13.[1] *Note:* 300 should read 1300 and 100 should read 1000.

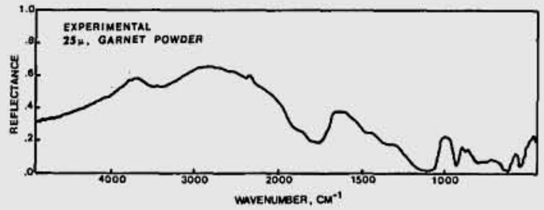

Fig. 2. Same measurement as Fig. 1 over full spectral range.

We obtained from Aronson one of the samples measured and measured it in the Willey 318S Fourier transform spectrophotometer[2] with integrating sphere. This system illuminates the sample at near normal incidence and measures the total flux reflected hemispherically; the spectral range is normally 2–20 μm (5000–500 cm^{-1}). No sample heating is required, and the results are obtained over the broader spectral region in less than 10 min total time. Theory would indicate that Aronson's results and ours should yield the same result; and they do, in fact.

The sample measured was 25-μm particle size garnet powder. Figure 1 shows our measurement plotted on approximately the same scale as Aronson's result in their Fig. 13 and over almost the same spectral range. The results show little difference. Figure 2 shows the entire spectrum of the same sample from 5000–500 + cm^{-1} as measured by the Willey 318S.

References

1. J. R. Aronson and A. G. Emslie, Appl. Opt. **12**, 2573 (1973).
2. R. R. Willey, Appl. Spectrosc. **30**, No. 5 (1976).

Symmetric optimization of dielectric interference filters for nonnormal incidence: erratum

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It should be noted that the examples described in our paper[1] assume the entrance and exit media to be of refractive index 1.44. This is not a necessary condition for the technique but rather chosen arbitrarily for illustrative purposes.

Reference

1. L. B. Stotts and D. C. McCall, Appl. Opt. 14, 2341 (1975).

Doubling and visibility enhancement of moiré fringes of the summation type

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This Letter concerns a new technique that doubles sensitivity and enhances visibility of moiré fringes of the summation type. Brief comments on classification of moiré fringes are also made.

The moiré, which is known as the interference between somewhat regular patterns, is classified into two types. One is the multiplication type, in which the intensity distribution of the first pattern is modulated by transmittance or reflectance of the second pattern. The second is the summation type, in which the intensity distribution of the interfering patterns is summed up to show a moiré pattern.

Assuming intensity distribution and transmittance to be sinusoidal, the intensity distribution of the multiplication moiré I_m is obtained by multiplying the transmittance distribution of the second pattern with the intensity distribution I of the first pattern, thus:

$$\begin{aligned} I_m &= (1 + \cos 2\pi x/s_1)\cdot(1 + \cos 2\pi x/s_2)I_o/4 \\ &= \{1 + \cos 2\pi x/s_1 + \cos 2\pi x/s_2 + [\cos 2\pi x(1/s_1 + 1/s_2)]/2 \\ &\qquad + [\cos 2\pi x(1/s_1 - 1/s_2)]/2\}I_o/4, \end{aligned} \tag{1}$$

where S_1 and S_2 are spatial periods of the two interfering patterns. The moiré term, which is characterized by $\cos 2\pi x(1/s_1 - 1/s_2)$, is isolated and governs the intensity of the fringe. The visibility of the moiré fringe is obtained as follows:

$$V = (I_{\max} - I_{\min})/(I_{\max} + I_{\min}) = \frac{1}{2}\,. \tag{2}$$

Intensity distribution of the summation moiré is obtained as follows:

$$\begin{aligned} I_m' = I_1 + I_2 &= [(1 + \cos 2\pi x/s_1) + (1 + \cos 2\pi x/s_2)]I_o/2 \\ &= [1 + \cos\pi x(1/s_1 + 1/s_2)\cdot\cos\pi x(1/s_1 - 1/s_2)]I_o. \end{aligned} \tag{3}$$

The moiré term is not isolated, as is the multiplication moiré, but appears as a constant, which modulates the amplitude of fine periodic variation of intensity characterized