Introduction of Variable Angle Absolute Reflectance Attachment for the SolidSpec-3700

The variable angle absolute reflectance attachment is an attachment that allows absolute reflectance measurement with an angle of incidence selectable within the range of 5° to 70°. Using a system in which a goniometer rotates the sample holder and detector (integrating sphere) on the same axis, the angle of incidence of light irradiated on the sample can be freely changed. Moreover, utilization of an integrating sphere when performing transmittance measurement allows variable-angle transmittance measurement and measurement of the scattered light angle distribution of transmitted light. This attachment can be installed in the highly-acclaimed SolidSpec-3700 UV-VIS-NIR spectrophotometer for measurements in the electrical and semiconductor fields. This Application News introduces an example of measurement of functional multilayer film used in solid-state lasers.

■ Variable Angle Absolute Reflectance Attachment

Fig.1 shows a photograph of the SolidSpec-3700 UV-VIS-NIR spectrophotometer unit, and Fig.2 shows a photograph of the variable angle absolute reflectance attachment. In addition, Fig.3 shows a photograph of the variable angle absolute reflectance attachment mounted inside the instrument, and Fig.4 shows a schematic diagram of the attachment construction.

Fig.1 SolidSpec-3700

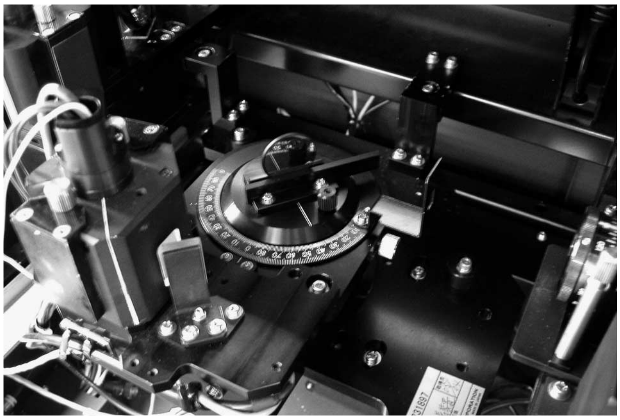


Fig.3 Variable Angle Absolute Reflectance Attachment Installed in SolidSpec-3700

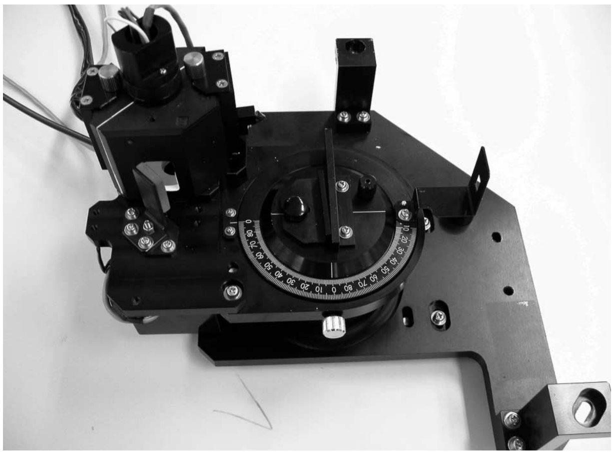


Fig.2 Variable angle absolute reflectance attachment

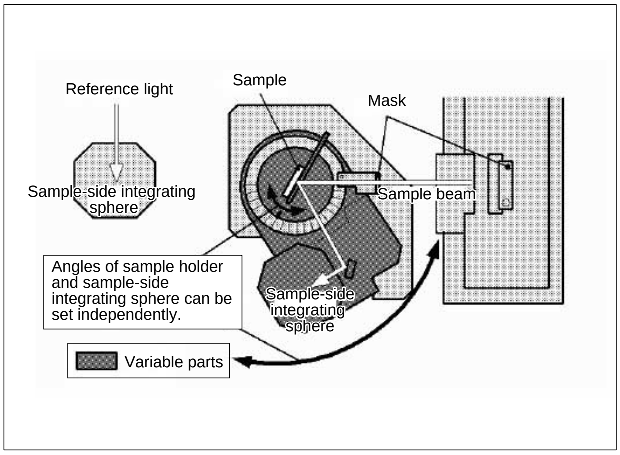


Fig.4 Schematic Diagram of Variable Angle Absolute Reflectance Attachment

■ Measurement of Anti-Reflection Film and High-Reflection Film for Solid-State Lasers

Using a variable angle absolute reflectance attachment, we evaluated a multilayer film (anti-reflection film and high-reflection film) used inside a solid-state yellow laser. A solid-state yellow laser outputs yellow 558 nm light by using 810 nm emission light to amplify 1116 nm light via the lasing medium in the resonator, and then passing it through a wavelength conversion element (converting it to 1/2 λ light).

Fig.5 shows the 5° absolute reflectance spectrum of the high-reflection film used in the resonator. This film must reflect the laser emission wavelength 1116 nm light without loss, and at the same time, transmit the laser emission 810 nm light. Fig.6 shows a magnification of the spectrum in the vicinity of 1116 nm (a) and a magnification of the spectrum in the vicinity of 810 nm (b). By shifting the entire spectrum toward the short wavelengths, it is evident that the desired characteristics become more attainable.

Fig.7 shows the 5° absolute reflectance spectrum of the anti-reflection film used for the output mirror of the wavelength conversion element. This film is produced with the aim of outputting 558 nm yellow light without loss, but from the magnified portion shown in Fig.8, it turned out that the reflectivity reached a minimum more toward the longer wavelength of 580 nm, beyond the target wavelength (558 nm).

From the above, it is clear that there should be a shift to the shorter wavelengths for both films.

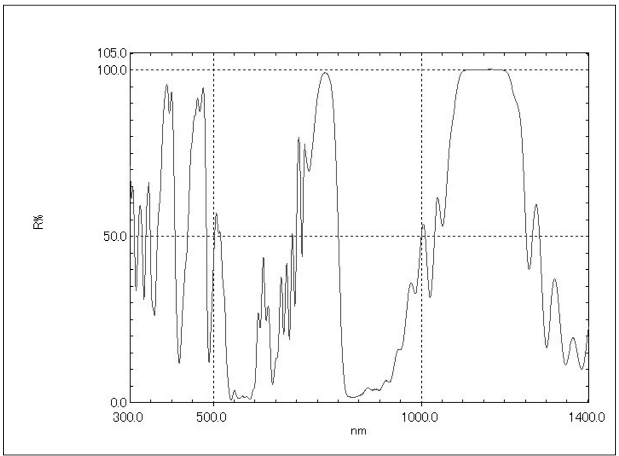


Fig.5 Absolute reflectance spectrum of high-reflection film used in yellow laser. (Incident angle : 5 degrees)

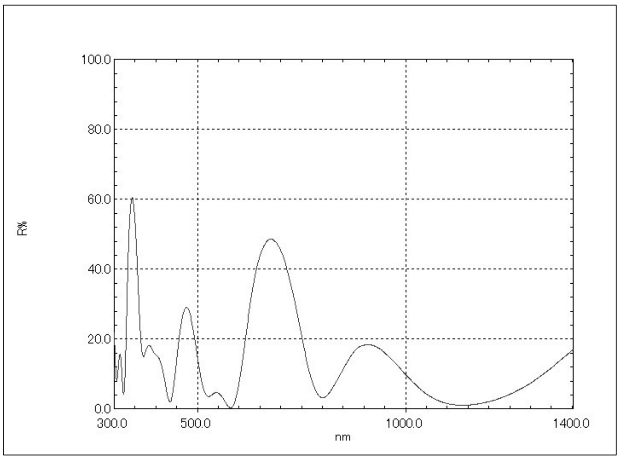
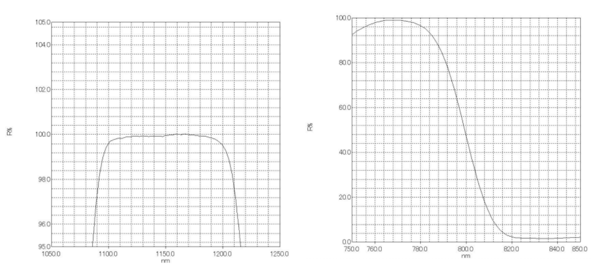


Fig.7 Absolute reflectance spectrum of anti-reflection film used in yellow laser (Incident angle : 5 degrees)



(a) Magnified spectrum at 1116nm

(b) Magnified Spectrum at 810nm

Fig.6 Magnified Regions of Fig.5

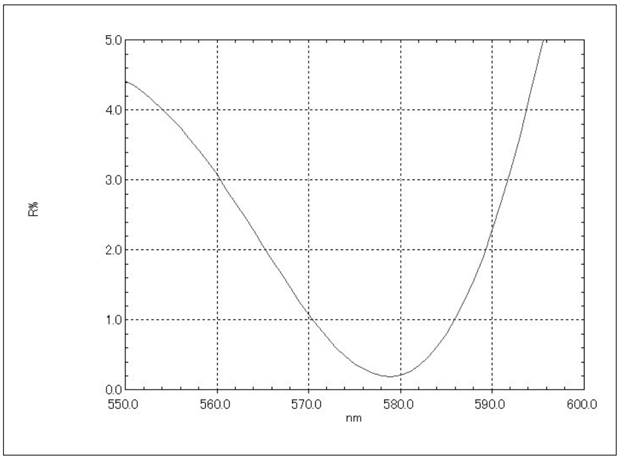


Fig.8 Magnified Region of Fig.7

NOTES:
✻This Application News has been produced and edited using information that was available when the data was acquired for each article. This Application News is subject to revision without prior notice.

SHIMADZU CORPORATION. International Marketing Division
3. Kanda-Nishikicho 1-chome, Chiyoda-ku, Tokyo 101-8448, Japan Phone: 81(3)3219-5641 Fax. 81(3)3219-5710
Cable Add.:SHIMADZU TOKYO

Printed in Japan 3100-01701-10A-IK