

Use the Night Shot in the right way. - Measurement of temperature in volcano crater -

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[Glowing spots in Aso crater]

Since November 2000, some glowing spots have been observed in Aso volcano crater. Aso volcano observatory reports that the temperature have been measured at 200-300 degree by an infrared thermometer. This value is also confirmed by Kyoto Univ. Aso Volcano Laboratory using another infrared thermometer. This temperature is, however, suspiciously low because the temperature must be at least higher than 500 degree to glow. One reason of this low measured value can be the absorption of the infrared rays by water vapor and carbon dioxide. We cannot approach the glowing spot closer than 200m because the spot locate near by crater pond. Considering this situation, the absorption of the infrared rays cannot be negligible. To avoid this effect, we measured the temperature with near infrared rays.

[The Night Shot]

Sony's popular handycam (not for professionals) has the NightShot function. This function enables to take movies in the dark for fun using infrared LED as a light. The CCD used in video cameras is natively sensitive to the light in the band broader than human eyes. Usually, near infrared is cut by the filter in the video camera. Sony's video camera switches off this filter and lengthen the shutter to bring up the sensitivity when the Night Shot is on.

Using this NightShot function, you can take clear movie of a hot soldering iron in the dark. The temperature of the soldering iron is 300-400 degree, and it does not glow, but the NightShot camera can detect the infrared rays emitted by a body at this temperature.

[Using as a thermometer]

To examine thermal characteristics of the Night Shot, some samples were heated by some torchs and measured the temperature by a thermocouple shooting the samples with the Night Shot. The samples were a metal plate and a rock plate. Although the Night Shot automatically adjusts all exposure parameter,

all information are recorded on the tape and can be read for calibration. The Gamma value was assumed at 2. Fitting curves to the measured values, the Night Shot can be used as thermometer in a range from 300 to 700 degree with accuracy of 20-30 degree.

Using this characteristics, the temperature of glowing spot of Aso Volcano was measured at 500 degree, which is higher than the temperature previously reported and much more acceptable.

[Use near-infrared when you want to measure temperature at volcano]

The reason why the Night shot does good job in measuring temperature, while expensive infrared thermometer fails, is the difference of the wave length of infrared rays. The conventional infrared thermometer uses infrared rays with the wave length of 10 micron, while the Night Shot can detect near-infrared rays with about 1 micron at maximum. The radiative energy density is proportional to 2-3rd power of the temperature at 10 micron but 18-19th power at 1 micron. Suppose that the atmosphere transmit only 30% of the radiated infrared rays, measurement of the temperature with 10 micron gives 300 degree lower value, while 1 micron measurement gives values within 50 degree.