**AS – 6342 Spectroscopic Reactive Flow Diagnostics**
**Dr. T. M. Muruganandam**
**Supplementary Exercise – 4**
**Feb 26, 2011**

**Data required for this exercise is uploaded on the website. This data is from the lab experiments performed earlier during class.**

**1.** From the Sheet "sunlight",
(a) Show that the cases 1&5 are similar and the cases 2, 3, nd 4 are similar. This was because of the angle of the sun rays with the fiber collection cone. In cases 1&5, the light was head on, while in the other cases the light was at slight angle! Data series 3&4 are repeats of the same conditions.
(b) Multiply the whole series by a constant to make the curves lie on top of each other. This will be done for the series 1&5 separately ad 3,4&5 separately. Now divide one by the other to obtain the transfer function for the fiber at an angle! Transfer function is the function of wavelength, which gives the transmission of light through the fiber at an angle as opposed to the head on condition!
(c) Discuss the drawbacks of the experiment in conducting such an analysis of the fiber performance.

**2.** From "Sheet 1". Pick head on sunlight case as reference sunlight. Note that we have also obtained the 'no light case' which should be subtracted from all the data, as this is the response of the spectrometer when there is no light.
(a) Find the reflectance of the violet shiny paper as a function of wavelength. Reflectance =reflected light/direct light for each wavelength. There are two data series from the violet sheet (second one with more integration time for the spectrometer). See if they both give the same data. Can we believe the reflectance function over the whole range of data available? Explain.
(b) Find the transmittance curve for the Blue translucent sheet which we used as blue filter.

**3.** From "Sheet2". This sheet gives data obtained by collecting light from computer monitor having bright white color.
(a) Show that all the three data series give exactly the same spectral behavior even though the integration times were different. You may need to smooth the data over five data points before interpreting them This is because of the low light levels in the source causing low signal-to-noise ratio.
(b) Find the filter characteristic of the blue filter sheet used in front of the white monitor. For what range of wave lengths can we believe the data? Explain.
(c) Find the filter characteristic of the green plastic of the screw driver handle used. For what range can we believe the data? Also compare the spectrum obtained from the similar (to our eye) green colored pixels from monitor.

**4.** From "Sheet3". Also use Sheet 2 for white light from monitor and green light from monitor.
(a) Plot the spectra of monitor white light, Monitor violet light, Monitor green light, Mobile phone white light (use only 'mobile1' data), Mercury Lamp white light. Multiply them appropriately by constants to make them comparable. Comment on the lights and their colors.

(b) Find the transmission characteristic of (i)Screwdriver green plastic and (ii) blue filter paper, from mercury lamp light transmission data and compare with the one obtained before using monitor light.

**5.** From “Sheet 4”. The series ‘Premixed flame burner5 rich’ represents the emission from the sooty zone of the very rich flame. Analyse the spectrum and estimate the soot temperature from black body emission like curve other than the standard emission spectra seen in other cases.