To evaluate the daylighting and thermal impacts of the selective transmissivity and reflectivity of the "smart window" the energy distribution in the solar spectrum should be recalled. The visible band (0.4 to 0.75 microns) accounts for about 45% of the total solar energy. About 5% is in the ultraviolet and about 50% is in the infrared band.

About 70% of the energy which is in the infrared solar band is between the wavelengths of 0.75 and 1.15 microns and about 30% is between 1.15 and 1.8 microns. Beyond 1.8 microns the energy in the solar spectrum is negligible.

In the clear state the average transparency of representative sample of the "smart window" (Goldner et al, 1987) was about 76% in the visible light and about 76% in the infrared band of .75 to .95 microns, 68% in the band .95 to 1.15 mi., 56% in the 1.15 to 1.4 mi, 40% in the 1.4 to 1.8 mi and about 11% beyond 1.8 microns.

In the colored state the glazing's average transmissivity in the visible part of the solar spectrum was about 38%, in the .75-.95 mi 22%, in the .95-1.15 band 18%, in the 1.15-1.4 band 11%, in the 1.4-1.8 band 9% and beyond 1.8 mi about 2%, as can be seen from figure.. (Goldner et al, 1987).

Based on these optical properties approximate calculations of the visible and infrared solar radiation transmitted through the "smart window" glazing in the two states were done by the author, on the basis of the transmittance data shown in figure.... and the solar energy contained in each spectral band. The results of these calculations are given in Table C.1.

The Table shows also similar calculations for Clear and for Low Emissivity (low-E) glasses. Low-E glass transmits about 70% of the visible band and an average of about 40% in the infrared.

Evaluating the Expected Impact of the "SMART WINDOW" in Buildings

Assuming that "smart window" glazing could be manufactured at sizes and at a cost appropriate for building's applications, some comments can be made on the basis of the reported properties of the glazing at the two states. These comments compare the "smart window" to conventional glazing and deals with different applications of solar energy in buildings.

Comparing "SMART WINDOW" to Clear Glass

"Smart window" in the bleached state

Transmissivity of a representative sample of smart window in the clear state, in the visible solar band (at incident angle of 20 deg.) was about 76%. In the "colored" state this value drops to about 38%. This should be compared to transmissivity of about 88% for clear glass in the visible light and an average of about 70% in the infrared.

Therefore, to have the same level of daylighting, when the "smart window" is in the clear state, only a small increase in the area of the glazing would be needed.