

## **4.5 UV absorption properties of natural solutions**

W.D.S. Wijesiri<sup>o</sup>, N. W. K. Jayatissa, J. R. P. Jayakody

<sup>o</sup> 160/11, Gettuwana Road, Kurunegala

Department of Physics, University of Kelaniya.

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### **ABSTRACT**

Electromagnetic radiation is classified into types according to the frequency of the waves such as radio waves, microwaves, terahertz radiation, infrared radiation, visible light, ultraviolet radiation, X-rays and gamma rays. UV radiation is a part of the electromagnetic spectrum emitted by the sun, and is divided according to wavelength into three regions known as UVA, UVB and UVC. The UVC is completely absorbed by the atmospheric ozone, water vapor, oxygen and carbon dioxide. However, both UVA and UVB are of major importance to human health. These radiations may penetrate into the skin and eyes, causing the adverse health effects, such as skin cancers, cataracts and immune suppression. The objective of this work is to support the mankind to prevent from the kind of threats and conflicts that they will face due to the harmful solar radiation using natural and available materials.

Initially the study is focused to identify the UV absorption properties of natural materials. In order to achieve this goal several fruit juices, vegetable juices and plant leaf extractions are analyzed by using UV/VIS spectrum. The sample path length (10mm) and concentration (0.75mol/l & pH = 2.3) are kept constant during the experiment. The Citrus family exhibited interesting UV absorption behavior compared with the other tested materials. The experiments are carried out using both distilled water and isopropyl alcohol as solvents. Especially chlorophyll of the plant extract is removed by dissolving it in isopropyl alcohol and filtering it through activated carbon.

When electromagnetic radiation passes through the compound, energy from the radiation is used to promote an electron from a bonding or non-bonding orbital into one of the empty anti-bonding orbital. The electron jump can be occurred or absorption takes place only when the energy associated with the particular wavelength is provided.

In terms of Chemistry, Flavonoides are water soluble Polyphenolic molecules containing fifteen Carbon atoms. The Flavonoides, belongs to the polyphenol family, are found in most plant material and dietary sources. It is presumed that absorptions occurred in the citrus family due to the double bonds of the Flavonoides. Energy of the incident radiation is promoted electron jumps ( $\pi \rightarrow \pi^*$ ,  $n \rightarrow \pi^*$ ,  $n \rightarrow \sigma^*$ ) which caused to the absorption spectrum as discussed earlier. It is clearly illustrated that lime juice absorbed the wavelength from 290nm to 400nm where UV-B and UV-A radiations exist. Zero transmittance of incident radiation in between 290 and 400nm's for lime juice is observed in the experiment. It is interesting to find the optimal path length for zero transmittance and it determines the minimum thickness of the filter.

One of the interesting applications of this finding is it can be converted any moisturizing cream into a moisturizing plus sunscreen by adding natural Flavonoides, just before the application.