



A SOLAR-POWERED WHITE LED-BASED UV-VIS SPECTROPHOTOMETRIC SYSTEM MANAGED BY PC FOR AIR POLLUTION DETECTION IN FARAWAY AND UNFRIENDLY LOCATIONS

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Abstract – This research work regards the design and realization of an absorption spectrophotometer based on a LED light source in place of the usually employed Xenon lamp. The advantage of the use of LED technology resides in several factors such as the reducing of the analyte temperature variations and thus noise generation, which occur if a Xenon light source is used, beside of the high luminous efficiency, reliability, operating duration, lower maintenance and a lower power consumption. This last factor allows to supply the entire designed apparatus using a solar panel thus making the system easily portable for use even in places where the electricity network is absent. An optical filtering system was realized in order to detect the analyte absorption for each wavelength range selected by the optical filters. A PC-interfaced PIC-based control unit used to manage the different functionalities required by the spectrophotometer was realized and tested. The control unit acquires and processes, via the developed firmware, the raw data provided by different sensors employed in the system. The sensors are used to monitor analyte temperature and humidity values, to control the analyte pressure and to acquire the luminous intensity value of the light beam before and after passing through the analyte. Finally, the realized electronic control unit actuates different mechanical sections (stepper motor, solenoid valve), sincronizing and controlling the data exchange between hardware sections, microcontroller and the PC.

Index Terms: Electronic control system, absorption spectroscopy, sensors, LED, PIC, firmware, measurements and prototype characterization.