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DEVELOPMENT OF OPTICALLYSTIMULATED LUMINESCENCE READER SYSTEM USING MICRO CONTROLLER

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Abstract

An integrated reader system for optically stimulated luminescence (OSL) Measurements has been described for research application. The optical stimulation section has four four LED's fitted in such a way that they are focused on the position of sample. The highly sensitive photo multiplier tube would be used to sense OSL signal from the sample. A low cost hardware system associated with micro controller will be utilized. A user-friendly software to control the entire designed system will be written in programming language like Python so that it can be run on any platform. The fabrication, design and development of reader system and automated dose measurement are discussed. This measurement system would be realized using suitable hardware and software to reduce the development cost.

Introduction

The optically stimulated luminescence signal emitted from an irradiated samplewhen sample was stimulated by light. When sample was irradiated, the charges were trapped. On optical stimulation, the sample the already trapped charges areto be released from meta-stable trap level and recombine with opposite polaritycharges and finally emit light. The sensitivity of designed measurement system measures minimum dose of sample. Dosimetery and dating studies needs the measurement of many samples in a limited short time. So OSL reader system isto be automated and introduced. The reader system should be compact, portable,low cost will be designed for stable measurement.

Objective

The main objective is to develop micro control based cost effective , portable, automated OSL reader system. The system is designed in such a way to reduce the time and the

sample is placed at particular position, sensed send the converted signal to micro controller based hardware and after processing the result will be monitored, displayed and facility to take print outs of graph obtained. User-friendly software helps in controlling the entire operation of designed system. Thus, this system gives a very efficient way of reading the sample parameter automatically without any human intervention.

Literature Review

1. Botter – Jensen (1997): described about development of OSL reader system. The review of techniques of luminescence stimulation and detection, which were commonly used.

2. Bøtter-Jensen, E Bulur, GAT Duller (2000): Advancements in designed luminescence system.OSL measurements of individual sand-sized single grains of a sample.It provide Facility for heating samples during beta irradiation and it performs OSL measurements in linear mode also included into the system.

3. Yukihara and Mckeever (2011): They described compact stable measurement luminescence system with facility of sample changer are controlled and monitored by a personal computer.

Methodology

OSL assembly has drawer arrangement. The drawer is opened and sample to be illuminated is kept inside the sample holder. The sample holder is pushed inside the assembly. The computer system is switched on. It will check the serial.

Connectivity with micro controller. During acquisition time the relay activates the LED control circuit consecutively the four LED's glows which stimulate the pre radiated sample also photo detector and feedback circuitary controls the intensityof the LED's. The luminescence signal from the sample is detected by PMT which generates current pulse signal. This signal is converted to analog voltage by using digital picoammeter. This analog voltage is converted to digital voltage by inbuilt analog to digital converter of micro controller. The output voltage with selected acquisition time will be monitored in real time, plotted and saved. Designing of graphic user interface and control of operation of entire system is done by python software programming.

Block Diagram

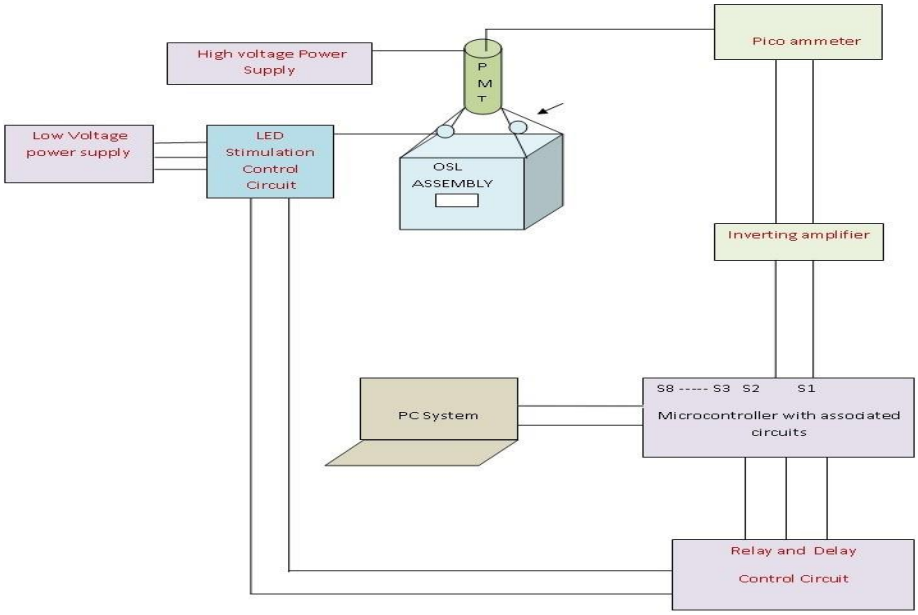

Fig : Block diagram of OSL system

Proposal of Project

The proposal of this project is to provide an automated Optically Stimulated Luminescence Reader system using micro controller with associated circuits and Graphic user interface to control the system. The result will be monitored and display on screen and to complete process in a shortest time period.

Application

This could be mainly employed in research Laboratory in different institution.

This designed system is useful to analyze and test various OSL samples fordifferent dosimetric measurements.

This system provides continuous wave OSL measurements.

It will be useful for multi sample measurements.

Conclusion

We will design and fabricated OSL assembly. All the components involved inthe set up were procured from local market keeping the cost of the setup low. Allthe available OSL readers are having at least 40 times bigger price than this setup. Present set up is flexible enough to accommodate additional attachments as seenwith the commercial instruments. Comparison shows that the obtained signals are in good agreement with

that from commercial instrument. Finally the low cost in-house fabricated set up has been found suitable for OSL signal procurement and can be used for research and academic purpose readily. In future, present setup can be modified to accommodate simultaneous multi-sample analysis, Portable wireless OSL reader with mobile app based graphic user interface is the need oftoday's world. Hence in the future, set up can be modified accordingly.

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