DEVELOPMENT OF DEVICES AND EXPERIMENTS TO TEACH COLORIMETRY/SPECTROPHOTOMETRY IN TERTIARY LEVEL EDUCATION

By

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Dissertation submitted in fulfilment of the requirements for the degree of MASTER OF PHILOSOPHY of the UNIVERSITY OF COLOMBO, SRI LANKA

December 2003

University of Colombo
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ABSTRACT

The research presented here consists of two parts.

Colorimeter is vastly used in testing and research laboratories all over the world. Although, principles related to this instrument are taught in the undergraduate study programs, practical component is lack of proper experiments to teach the internal function of the instrument. This instrument consists of a simple optical unit and electronic circuits to perform its functions effectively. The architecture of the colorimeter is the base to all other radiation-based instruments such as, spectrophotometers, flourimeters, flame photometers, etc. Therefore by knowing the internal design and the function of the colorimeter, students are able to understand the theory and practise of all radiation-based instruments effortlessly. This study develops a device to teach the internal architecture and the functions along with model experiments. Parameters to be optimised during the construction of the colorimeter have also been discussed. The knowledge gained from model experiments has been applied to develop a colorimeter to use in teaching and research laboratories. Performance of this colorimeter was evaluated and compared with commercial colorimeters and spectrophotometers.

Analysts are use to analyse samples using traditional experiments developed by various researches. This restricts the innovative ability of analysts by converting them to "recipe followers". Introducing creative practical schemes to undergraduate education system helps to produce more innovative personnel to present industrial job market. This study seeks to fulfil some of these needs by introducing novel approach to design a colorimetric/spectrophotometric experiments independently. The introduced scheme provides guidelines to develop a method to carryout

colorimetric/spectrophotometric experiment. Parameters to be optimised are also provided. The proposed approach was applied to determine Fe(II) using 1,10-phenanthroline. Moreover, guidelines to quantify parameters of the standard curve have also provided. This has also been applied to two analytes, MnO_4^- and Fe(II).