

Title : Development of Cost-effective Liquid Core Waveguide Spectrophotometer for Iron Determination

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ABSTRACT

In this project, a simple, sensitive and cost-effective liquid-core waveguide (LCW) based absorption spectrophotometer was developed. The principle of the optical device is based on modifying a liquid core to have a higher refractive index (RI) than that of the capillary tube by adding glycerol to achieve total internal reflection (TIR) inside the tube. This phenomenon allows for a long optical path in a compact design, improving the sensitivity of absorption spectrophotometric detection. The device was used to determine trace levels of ferric ions (Fe^{3+}) via a colorimetric complexation reaction with thiocyanate ions (SCN⁻). Under optimal conditions, a linear range of 10-400 nM, a limit of detection (LOD) of 5.9 nM, a limit of quantitation (LOQ) of 19.7 nM and a relative standard deviation below 3% were obtained. The proposed method was applied to the determination of free- Fe^{3+} in serum in the form of non-transferrin bound iron (NTBI).

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