

## Enzymatic Detection of Sulfamethaxazole based on Fiber Optic SPR Sensor

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Sulfamethaxazole (SMX) is an antibacterial drug belonging to sulfonamides family employed widely in treatment of many bacterial infections relating to respiratory and urinary tract, chronic bronchitis etc. Undesirable concentration of SMX in body fluids leads to many side effects like hematological and gastrointestinal disturbances, eosinophilia, antibiotic resistance, urinary tract lithiasis and potential threats on aquaculture [1]. Many methods such as chromatography, capillary electrophoresis and electrochemical have been developed over time for detection of SMX. Here we report an enzymatic method based on surface plasmon resonance for detection SMX. Surface plasmons are collective oscillations of charges at metal-dielectric interface. At particular conditions light can excite surface plasmons causing resonant energy transfer leading to change in one of its property which forms the basis of sensing [2]. We use a fiber optic probe for exciting surface plasmons, silver as the plasmonic material and tyrosinase (TYR) enzyme embedded in polyacrylamide gel [2] as sensing layer for SMX. Tyrosinase is a copper containing enzyme having non-equivalent cupric ions in its active site for the hydroxylation of phenols and aromatic amines by successive oxidations to o-quinoneimines [1].

The experimental set-up used for sensing is shown in fig. 1(a). The fiber optic probe consists of a 15cm multimode fiber unclad (1 cm) from the middle portion on which 40nm silver is coated using thermal evaporation. Over the silver layer tyrosinase entrapped in polyacrylamide gel matrix has been coated using dip coating method. When energy from incident light is transferred to surface plasmons we get a dip in transmitted light at a particular wavelength which changes with the concentration of SMX. It was found that as concentration of SMX is increased the SPR spectra shift towards longer wavelength side implying increase in refractive index of gel layer. The spectra is recorded at pH 8 of SMX solutions as enzymatic activity is maximum around this pH.

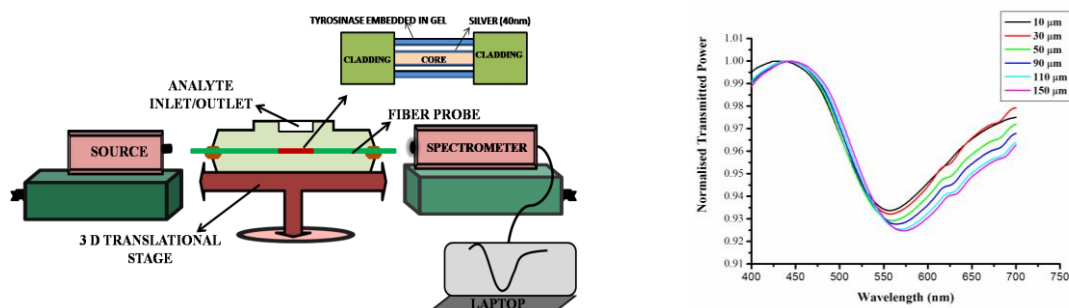


Fig 1. (a) Experimental Set-up (b) SPR curves for varying concentrations of SMX

### References

1. L. Román, M.Lomillo, O. Renedo, M. Martínez, Sensors and Actuators B 227 (2016) 48–53.
2. S. Singh and B D Gupta, Sensors and Actuators B 177 (2013) 589–595.