NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE
School of Electrical and Electronic Engineering

COEB PHOTONICS
COEB - Centre for OptoElectronics and Biophotonics

Heavy metal ion detection using optical microfiber sensor

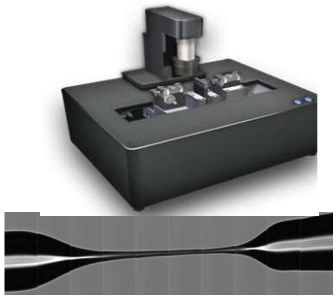
Methodologies

Heavy metal pollution in natural water environment is always a concern in both human and ecosystem health. Many heavy metals are lethal not only at high concentrations but can be deleterious even at very low concentrations, because they may be accumulated in human organs, causing long term negative health effects.

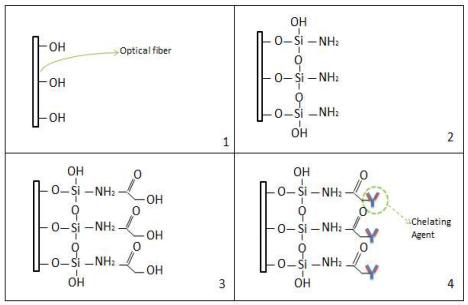
Micro scale based optical fiber sensors which demonstrate advantages such as high nonlinearity, low-loss interconnection with normal single-mode fiber and large evanescent field have been extensively studied during recent years. In this project, a non-adiabatically tapered microfiber functionalized with chelating agent such as EDTA on its surface is studied and utilized to detect heavy metal ions.

Experiments & Results

Sensor fabrication and Surface functionalization → **Experimental set-up** → **Sensitivity characterization**

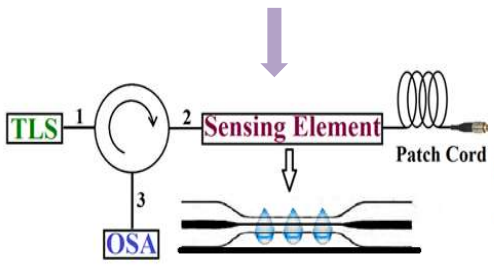


(a)

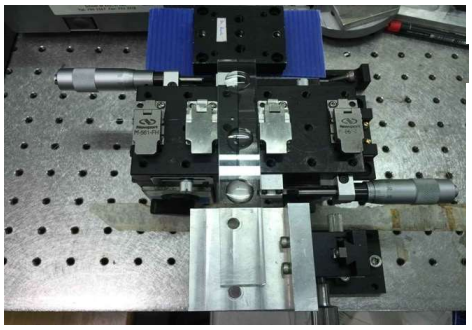


(b)

Fig. 1. (a)Fiber tapering machine and the fabricated non-adiabatic microfiber, (b) four steps of functionalizing the microfiber surface(coating with EDTA which is chelating agent for many heavy metal ions)

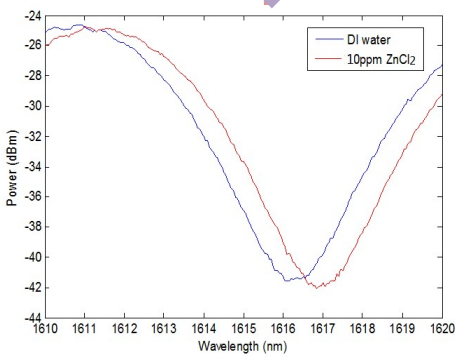


(a)

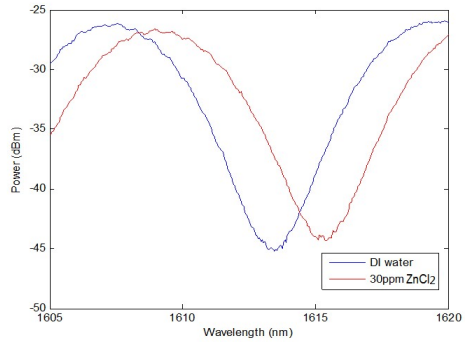


(b)

Fig. 2. (a) Microfiber sensor set-up using a double-pass reflection spectrum configuration (b) A strain insensitive setup using paired magnetic fiber clamps mounted on translation stages.



(a)



(b)

Fig. 3. Experiment results of microfiber sensor (with diameter of 7.6 μm) coated with EDTA and immersed into solutions of (a) 10ppm ZnCl2(b) 30ppm ZnCl2

Project Members
Assoc. Prof Ken Tye Yong
Dr. Yi-Hsin Chien
Mr. Abdul Rahman bin Shaik Alauddin
Ms. Stephanie Hui Kit Yap
Email: step0031@e.ntu.edu.sg
Tel: +65 6790-6319

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