University of Victoria | Graduate Studies

Notice of the Final Oral Examination
for the Degree of Master of Applied Science

of

AKSHARA ADIKE

B. Tech (Sri Padmavati Mahila Visvavidyalayan, 2012)

"Spectroscopic analysis of samples in aqueous environments using a hollow core fiber"

Department of Electrical and Computer Engineering

Thursday, February 6, 2020
2:00 P.M.
Engineering Office Wing
Room 502

Supervisory Committee:
Dr. Tao Lu, Department of Electrical and Computer Engineering, University of Victoria (Supervisor)
Dr. Aaron Gulliver, Department of Electrical and Computer Engineering, UVic (Member)

External Examiner:
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Chair of Oral Examination:
Dr. Richard Marcy, Department of Electrical and Computer Engineering, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

This thesis details the procedure, results of Raman spectroscopy obtained on graded concentrations of liquid samples passing through the core of a stand alone hollow core fiber(HCF). Followed by Raman spectroscopy is performed with the same samples in the core of a directional hollow core fiber coupler, fabricated using a silica core(SCF) single mode fiber and HCF using the principle of evanescent wave coupling, enabling the periodic transfer of light signal between SCF and HCF. With the SCF-HCF coupler, the core of the HCF can be filled with aqueous samples which leads to the change of the light signal propagating through the SCF as a result of the interaction of light with the sample at the coupling region. The study conducted a detailed and profound literature review which led to measuring the back reflections in contrast to the traditional measurement of propagating light in the SCF due to the light matter interaction. After a series of experiments using varying concentrations of samples such as Ytterbium Oxide (Yb_2O_3) suspension, Double Walled Carbon Nanotubes (DWCNT) suspension, aqueous H_2S, aqueous H_2S in DWCNT suspension, it is found that the concentrations of each sample are distinguishable by measuring the back reflections of the SCF-HCF coupler and the results are promising.