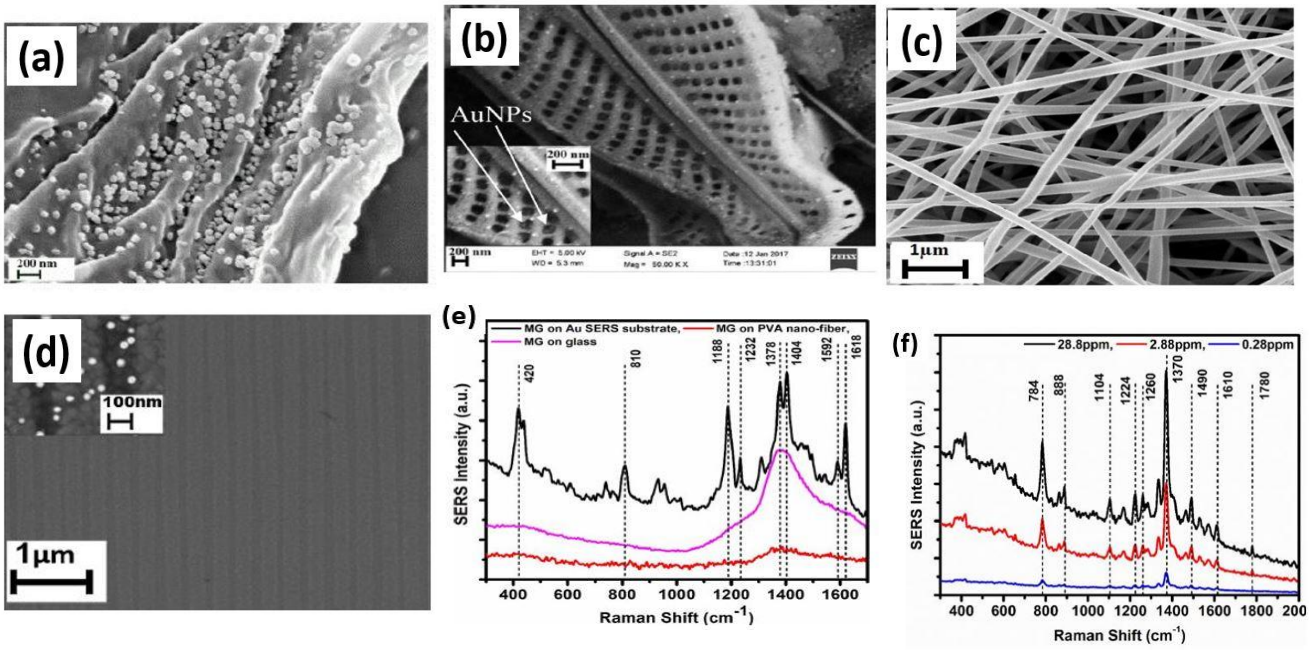
Surface Enhanced Raman Scattering (SERS) based sensing

SERS spectroscopy is a widely accepted analytical technique for molecular sensing applications. For last five decades, SERS is being used in a number of fields, like Analytical Chemistry, Biology, Medical Diagnosis, Defence and Security, Forensic Science etc. In SERS spectroscopy the weak Raman signals from a molecule is enhanced in the presence of novel metal nanoparticles (gold, silver). The phenomena of localized surface plasmon resonance (LSPR) contributes to the maximum portion of the signal enhancement. By periodically arranging the nanoparticles, it is possible to detect a molecule accurately and quantitatively.

In our lab we design and develop different type of SERS substrates using naturally and commercially available patterned micro and nanostructures. We have fabricated low-cost enhanced sensitive SERS substrates using (a) printing grade paper, (b) diatom, (c) electrospun nanofibers and (d) blu-ray DVDs. We have studied the enhancement, reproducibility and other characteristics of the substrates by analyzing the Raman spectra of Raman active chemicals like malachite green (MG), rhodamine 6G. Also the performance of the fabricated substrates were evaluated through detection of trace amount of pesticides, proteins, urea and other inorganic chemicals. Figure (e) and (f) shows the characteristic Raman spectra of MG and pesticide quinalphos.



References:

1. Chamuah, N., Chetia, L., Zahan, N., Dutta, S., Ahmed, G. A., & Nath, P. *A naturally occurring diatom frustule as a SERS substrate for the detection and quantification of chemicals*. Journal of Physics D: Applied Physics, 50(17), 175103, 2017.
2. Chamuah, N., Hazarika, A., Hatiboruah, D., & Nath, P. *SERS on paper: an extremely low cost technique to measure Raman signal*. Journal of Physics D: Applied Physics, 50(48), 485601, 2017.
3. Chamuah, N., Bhuyan, N., Das, P. P., Ojah, N., Choudhary, A. J., Medhi, T., & Nath, P. *Gold-coated electrospun PVA nanofibers as SERS substrate for detection of pesticides*. Sensors and Actuators B: Chemical, 273, 710-717, 2018.
4. Chamuah, N., Saikia, A., Joseph, A. M., & Nath, P. *Blu-ray DVD as SERS substrate for reliable detection of albumin, creatinine and urea in urine*. Sensors and Actuators B: Chemical, 285, 108-115, 2019.