

## Applications:

- Biochemistry
- Chemical manufacturing
- Environmental detection
- Forensics

## Benefits:

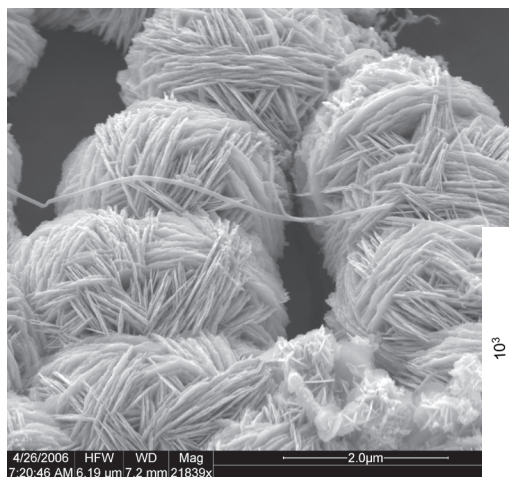
- Rapid deposition
- Reproducible
- Less complex than existing methods
- Inexpensive

## Contact:

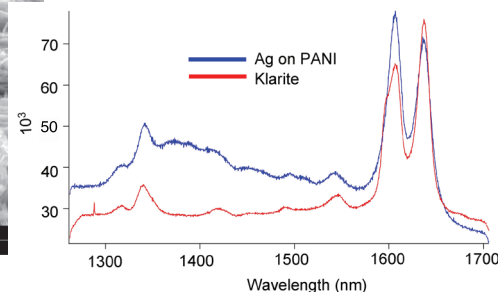
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*Surface enhanced Raman spectra of bipyridylethylene on Ag nanoparticle-decorated polyaniline(PANI) surface.*



## Summary:

Surface Enhanced Raman Scattering (SERS) is a powerful and flexible tool for sensing a broad array of materials. SERS has been applied to biochemistry, chemical manufacturing, environmental detection, and even forensics. Using SERS, coupled with separation technologies, it is possible to identify single molecules in complex solutions.

Los Alamos National Laboratory has developed a method for making SERS substrates with either silver or gold using a very easy, inexpensive, and reproducible process. We estimate that a substrate can be manufactured for less than \$1 per square centimeter. The technique does not require any photolithographic or high-tech deposition equipment.

Applying this process, we can demonstrate the electrodeless deposition of nanostructured metals, such as silver (Ag) and gold (Au), by immersing the prefabricated, porous, conducting polymer membranes into an aqueous solution, such as silver nitrate or gold chloride, for a time period of only a few minutes. The morphology of the nanostructured metal can be controlled by varying the surface chemistry, oxidation states, and polymer conformations of conducting polymer. For example, nanostructured Ag grown on top of acid-doped polyaniline (PANI) has a complex, sheet-like morphology with sharp edges. Similarly, Au clusters grown on top of the undoped PANI comprise many smaller nanoparticles with sharp edges. These metal structures show very strong SERS activity.

## Development Stage:

This technology has been reduced to practice. See the above plots of SERS spectra obtained from our PANI substrate (blue) versus Klarite (red) substrate.

## Intellectual Property Status:

Patent pending

## Licensing Status:

The Laboratory is seeking development partners to optimize this technology for specific applications. The technology is available for both nonexclusive and exclusive-for-field-of-use licensing.

[www.lanl.gov/partnerships/license/technologies/](http://www.lanl.gov/partnerships/license/technologies/)

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