

Parallel Plasmonics and Raman In-Situ Study of Au Nanoparticle: Metal Oxide Interfacial Catalytic Reactions

PI: Michael Carpenter

Co-PI: John Hartley

NSF Proposal Number: 1006399

Research Program:

- Plasmonic and Raman properties of Au nanoparticles embedded in metal oxides are dependent on the nanocomposite's properties
- Correlate surface chemistry, compositional and morphological effects with in-situ plasmonic and Raman spectra
- Study Ebeam patterned Au nanoparticles coated with metal oxides (YSZ, TiO₂, and CeO₂ (doped with Gd or Sm dopants))
- Determine Interfacial reaction dependencies upon exposure to CO, H₂, NO₂ in oxygen containing atmospheres

Education:

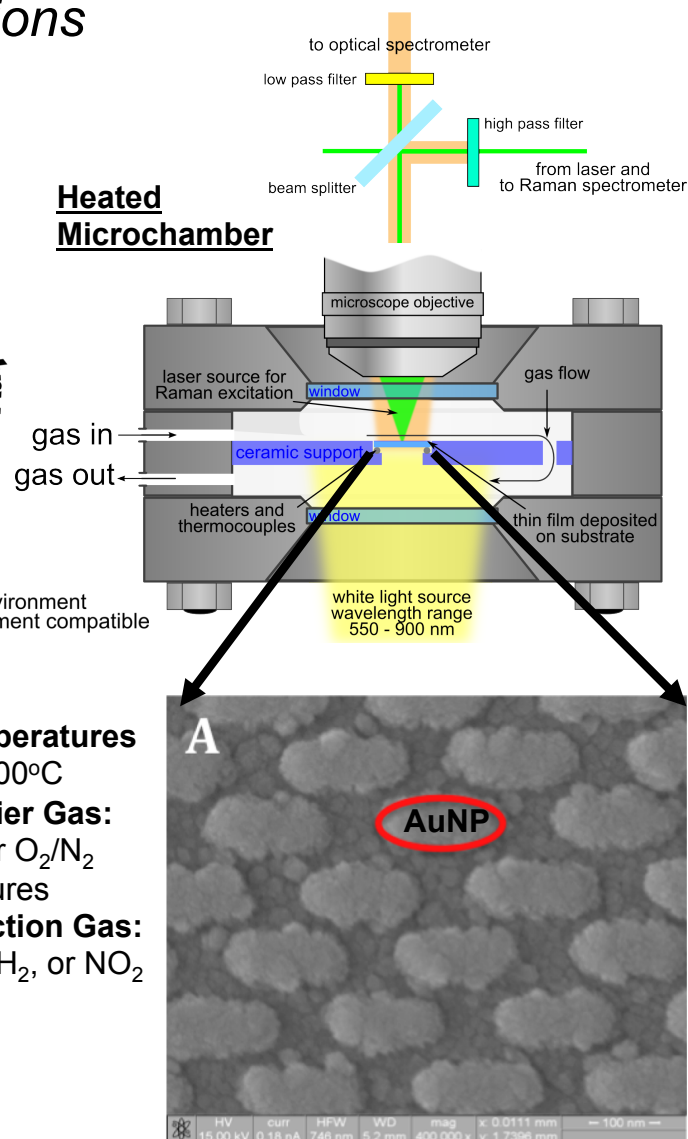
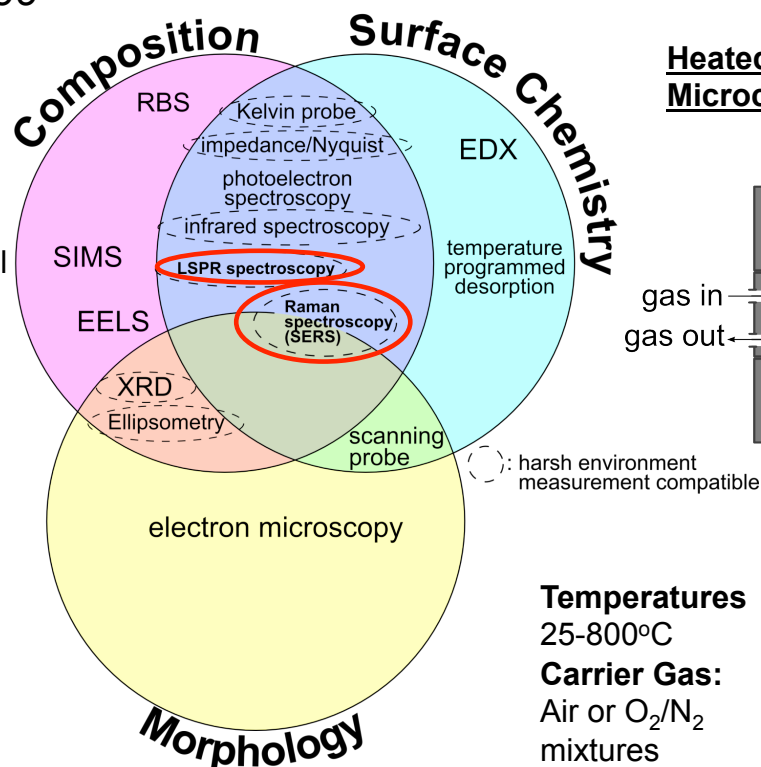
- Graduate students, summer interns
- Outreach to high school students

Facilities:

- E-beam lithography
- XRD, XPS, SEM, ESEM, TEM, and RBS and will be used to determine the microstructure and composition of these films
- Renishaw and Ocean Optics systems for in-situ Raman and LSPR spectral analysis
- Heated microchamber, < 800°C, for in-situ analysis of gas exposure experiments

Collaborations:

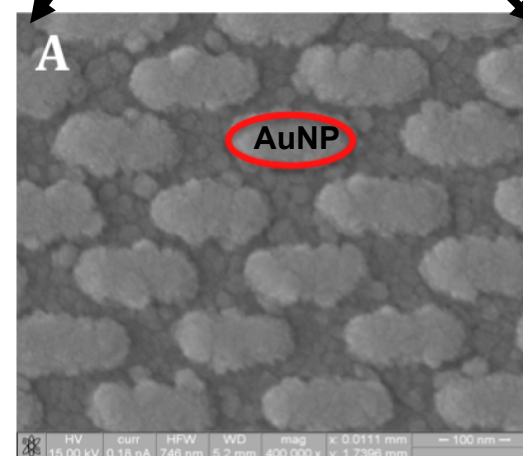
- Andrei Kolmakov – Southern Illinois University at Carbondale
- Thevuthasan, Suntharampillai – Pacific Northwest National Laboratory



Temperatures
25-800°C

Carrier Gas:
Air or O₂/N₂
mixtures

Reaction Gas:
CO, H₂, or NO₂



E-beam patterned gold nanorods

- 10nm YSZ overcoating
- Annealed to 800°C