## Parallel Plasmonics and Raman In-Situ Study of Au Nanoparticle: Metal Oxide Interfacial Catalytic Reactions **PI:** Michael Carpenter to optical spectrometer **Co-PI:** John Hartley low pass filter Surface Chemist NSF Proposal Number: 1006399 high pass filter Composition RP from laser and to Raman spectrometer beam splitter Heated **Research Program: Microchamber** •Plasmonic and Raman properties of Au Kelvin probe impedance/Nyquist nanoparticles embedded in metal oxides microscope objective photoelectron are dependent on the nanocomposite's spectroscopy properties infrared spectroscopy gas flow laser source for temperature programmed SIMS Raman excitation Correlate surface chemistry, compositional LSPR spectroscopy desorption gas in and morphological effects with in-situ Raman EELS spectroscopy plasmonic and Raman spectra gas out- Study Ebeam patterned Au nanoparticles heaters and hin film deposited on substrate XRD thermocoup coated with metal oxides (YSZ, TiO<sub>2</sub>, and Ellipsometry scanning CeO<sub>2</sub> (doped with Gd or Sm dopants) probe white light source : harsh environment wavelength range measurement compatible Determine Interfacial reaction dependencies upon exposure to CO, $H_{2}$ , electron microscopy NO<sub>2</sub> in oxygen containing atmospheres **Temperatures Education:** 25-800°C •Graduate students, summer interns **Carrier Gas:** AuNP Outreach to high school students Air or $O_2/N_2$ orphology mixtures **Facilities: Reaction Gas:** •E-beam lithography $CO, H_2, or NO_2$ •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:** E-beam patterned gold nanorods 10nm YSZ overcoating

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## College of NanoScale Science and Engineering

•Annealed to 800°C