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Surface Plasmon-Phonon Interaction in Zinc Oxide and Gold Thin Films ANDREW TRENCHARD, ANTHONY MAYO, RICHARD MU, Fisk University, NMSG TEAM — Surface plasmon-exciton coupling for the purpose of enhancing band edge emission has drawn a great deal of interest in recent years. ZnO and either Au or Ag nanoparticles have been used to extensively study this phenomenon. ZnO has been chosen due its wide band gap (3.37 eV) located in close proximity to the surface plasmon resonances of the Au and Ag nanoparticles and its large exciton binding energy (60 meV at room temperature), which helps with its stability at temperatures at and above room temperature. Very limited work has been done to understand surface plasmon-phonon interactions at this point, which will lead to a greater understanding of the energy transfer from metal nanoparticles to semiconductors. There has been some work done with ZnO and Ag nanoparticles showing enhanced phonon peaks due to Ag surface plasmons. In order to further understand the interaction between surface plasmons and phonons, varying thicknesses of ZnO thin films (10, 20, 30 & 40 nm) were deposited by way of e-Beam Evaporation on an Au film (5 nm) on top of an SiO2 film (50 nm), both sputtered onto SiO2 substrates. These samples were then annealed at 700 C to form Au nanoparticles. The surface Plasmon-phonon interaction was studied using Raman spectroscopy and photoluminescence spectroscopy and the results will be discussed.

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