Thermoplasmonic Decay of Metal-UNIVERSITY OF ARKANSAS **Polymer Nanocomposites** Graduate School & International Education Student: Tyler V. Howard Mentor: Dr. Keith Roper (CHEG) Nanoscience & Microelectronics-Photonics

Photonics

Engineering Undergraduate School / Major: Southeast Missouri State University / ENGR Physics Background/Relevance Approach Randomly arranged nanoparticles in a polymer have been Shine a concentrated, 532 nm, green laser found to resonant with a certain wavelength of light and emit beam onto samples of PVP film with or scatter light or gain energy as heat. varying concentration of gold Recently it has been discovered that the extinction per nanoparticles. nanoparticle of gold nanoparticles in PVP film is has a Use a thermal imaging camera to record decreasing trend according to concentration. the temperature change and MATLAB Innovation thermodynamic properties of each Green (532 nm) las concentration of PVP film. Determine the change in temperature per nanoparticle and Analyze images using MATLAB program to compare with extinction per nanoparticle. • Diffuse determine thermal properties of gold Data can influence the concentration of nanoparticles needed nanoparticle PVP films. to wipe out a cancer cell. Lens **Key Results Conclusions** Average tau value for each concentration of gold nanoparticles Change in temperature per NP decreases as concentration was approximately 22 seconds while earlier work indicated tau increases, and matches extinction per NP and EMT. values of \sim 5 seconds Decreasing trend in ΔT per NP implies there is an ideal • Change in temperature per nanoparticle values range from 1.93 concentration where a higher temperature cannot be obtained. to 4.93 x 10⁻⁷ °C/Particle. Decreasing trend implies an optimal minimum concentration for . any required temperature change. 5.50E-07 Thermal Optical 5.00E-07 Compared with previous results, PVP film appears to be thermally ٠ 4.50E-07 4.00E-07 insulating gold nanoparticles beyond expectation. 10.00 3.50E-07 Acknowledgements to Dr. Keith Roper, Greg Forcherio and Jeremy Dunklin for d/LV 2.50E-07

2.00E-07

1.50E-07 1.00E-07 2.00

7.00E+14 1.60E+15 2.50E+15 3.40E+15 4.30E+15 5.20E+15 AuNP Concentration (NP/cm³)

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