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Plasmon Behavior in Gold Nano-dot Media N. LIMBEROPOULOS, J. DEROV, A. DREHMAN, E. CRISMAN, Air Force Research Laboratory, Hanscom AFB, MA — We present correlations between the plasmon resonance of a gold nano-dots medium suspended in Al_2O_3 and the plasmon resonance of a single layer film of solid gold. We also present the effective medium properties of multi-layered, dot-film media. The gold dots were fabricated on Al_2O_3 substrates by sputter-depositing the gold and then annealing the resultant films. The median dot size ranged from 70 to 250 nm depending on the processing. Successive Au-dot layers were made by depositing Al_2O_3 over the previous dot pattern followed by depositing another gold film, followed by re-annealing. We used attenuated-total-reflection to couple transverse-magnetic optical waves to the plasmon resonance and controlled the degree of coupling by varying the spacing between the dot medium and the coupling prism. The plasmon resonances for the dot media had asymmetric line shapes compared to that for the continuous gold film. We were able to show correlations between that asymmetry and the spatial parameters of the dot/ Al_2O_3 media construction. Effective media parameters and the dispersion characteristics for nano-dot/ Al_2O_3 bi-layer were determined.

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