Characterizing the Optical Absorbance of PVP Thin Films Containing Gold Nanoparticles with Effective Medium Theory

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Background/Relevance

- Optical materials are being studied for their applications in energy, sensing, and information technologies.

Innovation

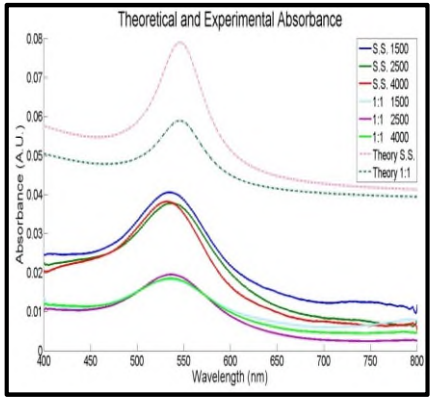
- Being able to model optical response of materials such as noble metals dispersed in optically transparent polymer would allow for better design and integration of these materials .

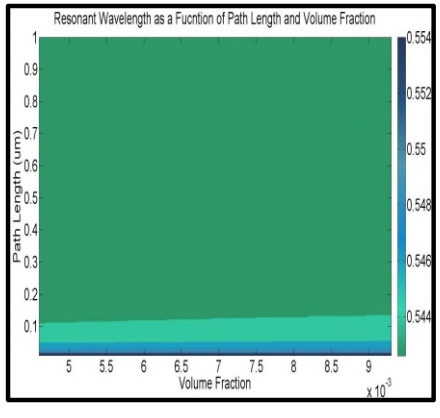
Approach

- Refractive index (N) and extinction coefficient (K) data were gathered from literature.
- PVP containing gold nanoparticles was spun onto BK-7 glass.
- Maxwell Garnett Effective Medium Theory was used to calculate an effective dielectric function for the film.
- N,K data were used to calculate theoretical absorption spectra.

Key Results

- Theoretical absorption peaks occurred at wavelengths consistent with experimental measurements.
- Limits exist for the model at a thickness of about 10 nm.





Conclusions

- A parameter that represents the effects of nanoparticle size on peak location needs to be added to the model.
- Model validity is dependent on accurate physical thickness measurements.

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