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TITLE

Elastic and Inelastic Light  
Scattering of Colloidal Particles

TYPE OF REPORT (TECHNICAL, FINAL, ETC.)

Final

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silver hydrosols, silver organosols and roughened silver electrodes, the effect of aggregates on SERS.

In addition there have been ancillary studies dealing with absorption and luminescence by dye coated silver particles, analysis of biological cells by flow fluorimetry, and electromagnetic scattering by magnetic particles.

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)  Light Scattering Fluorescence Luminescence  Raman Scattering (Surface Enhanced Raman Scattering)		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The project has been primarily concerned with both theoretical and experimental aspects of surface enhanced scattering. The theory has been extended to include concentric spherical particles, the effect of surface coverage, enhancement of coherent anti-Stokes Raman scattering and the effect of dielectric cavities. The experimental work included SERS from citrate on silver hydrosols, surface enhanced resonance Raman scattering (SERRS) for dabsylaspartate on (over		

## Statement of Problem Studied:

The studies carried out during the period of this grant have responded mainly to the query: How is the Raman or fluorescent scattering affected when the active molecules are embedded within dielectric particles or are adsorbed at the outer surface of either dielectric or metallic particles.

## Summary of Most Important Results:

The large enhancement of Raman signals from molecules adsorbed at the surface of colloidal silver occurs because of the resonant excitation of surface plasmons at particular excitation frequencies. These resonant effects depend upon both the dielectric properties of the material and the size and morphology of the particles. Silver is particularly effective because of its dielectric properties. We have shown how a partially coagulated system the excitation profile for SERS shifts with extent of coagulation in agreement with the above notion. By utilizing a chromophoric molecule such as dabsyl aspartate we have been able to obtain an overlap of the resonance Raman effect and the surface enhancement effect giving rise to SERRS. Then by utilizing a AG organosol or a roughened silver electrode, it has been possible to decouple the two effects giving rise to observation on the same surface of SERS and surface resonance Raman scattering SRRS.

Detailed results may be found in the 24 published papers listed below.

## List of Publications:

1. D.-S. Wang and M. Kerker, Absorption and Luminescence of Dye Coated Silver and Gold Particles, *Phys. Rev. B.* 25, 2433-2449 (1982).
2. M. Kerker, D.-S. Wang, H. Chew, O. Siiman and L.A. Bumm, Enhanced Raman Scattering by Molecules Adsorbed at the Surface of Colloidal Particles, in Surface Enhanced Raman Scattering, Edited by R.K. Chang and T.E. Furtak, Plenum, 1982, p. 109-128.
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4. M. Kerker and C.G. Blatchford, Elastic Scattering, Absorption, and Surface-Enhanced Raman Scattering by Concentric Spheres Comprised of a Metallic and a Dielectric Region, *Phys. Rev. B.* 26, 4052-4063 (1982).
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12. O. Siiman, A. Lepp and M. Kerker, Absorption and Surface-enhanced Raman Spectra of Silver Organosols in Ethanol, *Chem. Phys. Lett.* 100, 163-168 (1983).
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16. M. Kerker, An Electromagnetic Model for Surface Enhanced Raman Scattering (SERS) on Metal Colloids, *Accounts of Chem. Rev.* 17, 271-277 (1984).
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18. O. Siiman, R. Smith, C. Blatchford and M. Kerker, Combined Surface-enhanced and Surface Resonance Raman Spectra of Dabsyl Aspartate Adsorbed on a Silver Electrode, *Langmuir* 1, 90-96 (1985).

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