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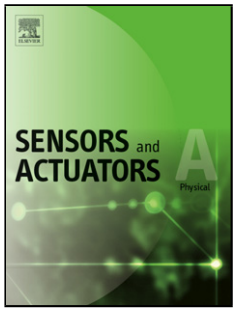

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Plasmon-Plasmon Interaction effect on Reproducible Surface-Enhanced Raman Scattering for Dye Molecule Detection

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Significance and novelty of this work:

- ✓ Producing of the reproducible Raman signal enhancement agents in the collided system for detection of a dye molecule
- ✓ Core/shell nanoparticles plasmonic effect on third-order susceptibility
- ✓ Analyzing of the third-order susceptibility, which is arisen due to nanoparticles plasmonic resonance, effect on Raman signal enhancing
- ✓ Producing of the stable and reproducible collided core/shell nanoparticles for Raman signal enhancing
- ✓ Engineering the non-linearity or third-order susceptibility of core/shell nanoparticles effect on a molecule polarizability

Abstract: In this study, we investigate the colloidal core/shell nanoparticles as the reproducible agents for a sensitive detection of a dye molecule through Raman scattering enhancement. By engineering the core/shell nanoparticles plasmonic resonance at the special region (nearby dye molecules), the Raman scattering signal will be enhanced. Actually, one of important goal is to investigate the relationship between the molecular polarizability and nonlinear properties of the medium which can be dramatically affected by the nanoparticles high intensity localized plasmonic field. In fact, the nanoparticles plasmonic near-field couplings to any adsorbed dye molecules cause to the molecule's vibration changing. Indeed, by inducing the third-order susceptibility effect, the polarization of the adsorbed molecules on NPs will be influenced and so the Raman enhancing will be occurred. Moreover, we experimentally show that the Raman signal enhancement by the present core/shell nanoparticles is purely reproducible and consistent with the related theory. Additionally, the comparison between the colloidal traditional nanoparticles and nanorods and core/shell nanoparticles Raman signal enhancing is done. Finally, this paper's original goal is to produce the reproducible Raman scattering enhancing agent.

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