STUDY OF SURFACE ENHANCED RAMAN SCATTERING OF ALIZARIN AND CRYSTAL VIOLET DYES

RAM GOPAL and RAJ KUMAR SWARNKAR, *Laser Spectroscopy and Nanomaterials Lab, Department of Physics (UGC-CAS), University of Allahabad, Allahabad-211002, India.*

Surface enhanced Raman scattering (SERS) plays a vital role in analytical chemistry to characterize ultra trace quantity of organic compounds and biological samples. Two mechanisms have been considered to explain the SERS effect. The main contribution arises from a huge enhancement of the local electromagnetic field close to surface roughness of the metal structures, due to the excitation of a localized surface plasmon, while a further enhancement can be observed for molecules adsorbed onto specific sites when resonant charge transfer occurs. SERS signals have been observed from adsorbates on many metallic surfaces like Ag, Au, Ni, Cu[a],[b] etc. Additionally, metal oxide nanoparticles also show SERS signals[c]. It has now been established that SERS of analyte material is highly dependent on the type of substrate involved. Many types of nanostructures like nanofilms, nanorods, nanospheres etc. show highly efficient SERS signals. In particular, there are two routes available for the synthesis of these nanomaterials: the chemical route and the physical route. Chemical route involves many types of reducing agents and capping agents which can interfere in origin and measurement of these signals. The physical route avoids these anomalies and therefore it is suitable for the study of SERS phenomenon. Pulsed laser ablation in liquid medium[d],[e] is an excellent top down technique to produce colloidal solution of nanoparticles with desired shape and size having surface free from chemical contamination, which is essential requirement for surface application of nanoparticles. The present work deals with the study of SERS of Crystal violet dye and Alizarin group dye on Cu@ Cu_2O and Ag colloidal nanoparticles synthesized by pulsed laser ablation.

---

[a] M. Fleishchmann, P. J. Hendra, and A. J. McQuillian *Chem. Phys. Lett.* **26**, 163, 1974.
[b] U. Wenning, B. Pettinger, and H. Wetzel *Chem. Phys. Lett.* **70**, 49, 1980.
[c] S. C. Singh, R. K. Swarnkar, P. Ankit, M. C. Chattopadhyaya, and R. Gopal *AIP Conf. Proc.* **1075**, 67, 2008.
[d] S. C. Singh, R. K. Swarnkar, and R. Gopal *J. Nanosci.. Nanotech.* **9**, 5367, 2009.
[e] R. K. Swarnkar, S. C. Singh, and R. Gopal *AIP Conf. Proc.* **1147**, 205, 2009.