# Effect of post-synthesis surface modification on the SERS activity of silver nanoparticles

*Tea Juračić* [a], *Tajana Begović* [a], *Adriana Kenđel* [a]

[a] *Department of Chemistry, Faculty of Science, University of Zagreb, Zagreb, Croatia*

*tjuracic@chem.pmf.hr*

Silver nanoparticles (AgNPs) are widely investigated due to their unique plasmonic properties that enable a broad range of applications in chemical sensing, spectroscopy, and nanomaterials engineering.[1,2] Among these, their use as substrates for surface-enhanced Raman scattering spectroscopy (SERS) is particularly important, as AgNPs can provide strong Raman signal enhancement through localized surface plasmon resonances.[3]

In this study, colloidal silver nanoparticles prepared by chemical reduction were examined with a focus on how post-synthesis treatment and surface environment influence their physicochemical properties and SERS performance. Surface modification was explored through controlled washing procedures as well as through adsorption of polymeric species at the nanoparticle surface. These strategies enable the investigation of how variations in surface composition, residual ionic species, and interfacial interactions influence nanoparticle behavior. The physicochemical properties of the resulting colloidal systems were characterized using dynamic and electrophoretic light scattering to evaluate particle size, electrokinetic potential and colloidal stability. The SERS activity of the AgNPs was investigated using the model molecule 1,2-bis(4-pyridyl)ethylene (BPE). Particular attention was paid to adsorption phenomena and adsorption-induced changes at the nanoparticle surface, and their influence on Raman signal enhancement. These observations highlight the importance of surface chemistry in determining the performance of silver-based SERS substrates.

Overall, this work emphasizes the role of controlled post-synthesis treatment and adsorption investigation, including the possible involvement of polymer-mediated surface interactions, in the development of tunable and reproducible AgNP systems for SERS and related analytical applications.

**Keywords:**
silver nanoparticles, SERS spectroscopy, surface modification, adsorption, BPE

**References:**

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