



SERS-active substrates using DVD-R coated in silver thin films: A preliminary study for detection of commercial glyphosate

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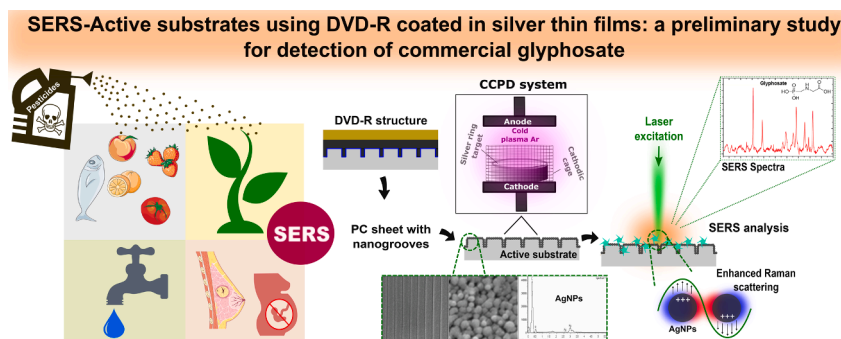
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HIGHLIGHTS

- Alternative detection methods are required to reduce the harmful effects of GLP.
- In SERS research, DVD-R nano-patterning substrates allow cost-efficient production.
- Low concentrations of GLP can be detected using DVD-R@AgNPs substrate.
- A novel method for SERS research employs AgNPs deposition via the CCPD technique.

GRAPHICAL ABSTRACT



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ABSTRACT

Glyphosate (GLP) is the herbicide with the highest level of global commercialization and historical use. Even though numerous studies have found this substance to be harmless, current research demonstrates that GLP might affect human health. For this reason, researcher efforts are concentrating on alternatives for analytical quantification, such as Surface Enhanced Raman Spectroscopy (SERS). In this work, a DVD-R@AgNPs SERS substrate was produced by the Cathodic Cage Plasma Deposition (CCPD) technique, which allowed a thin film layer deposition of silver nanoparticles (AgNPs) on the PC grating structure from Digital Video/Versatile Disc Recordable (DVD-R). Scanning Electron Microscopy with energy-dispersive X-ray spectroscopy was used to characterize the substrate and chemical changes on the surface after AgNPs deposition. The DVD-R@AgNPs substrate was used to detect standard crystal violet (CV), GLP, and Roundup™ GLP (GLP-RU) using Raman Spectroscopy. The CV was used as a control sample for SERS measurement, allowing the calculation of the substrate enhancement factor, which was in the order of $\sim 10^5$. To evaluate the efficiency of the SERS substrate, the limit of detection was calculated and showed values of $\sim 10^{-10}$ mol/L for CV, 10^{-7} and 10^{-8} mol/L for GLP,

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