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FABRICATION OF SURFACE-ENHANCED RAMAN SPECTROSCOPY SUBSTRATES USING SILVER NANOPARTICLES PRODUCED BY LASER ABLATION IN LIQUIDS

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Surface-enhanced Raman spectroscopy (SERS) is a Raman variant technique that uses the plasmonic characteristics of metallic nanostructures to intensify Raman signals. The most widely utilized metallic nanoparticles are silver, gold, and copper nanoparticles. Silver nanoparticles (AgNPs) are the most sensitive, with distinctive optical, physical, catalytic, and chemical properties. Physical and chemical approaches are among the ways used to make them. Alternatives to well-known chemical processes include laser ablation of solids in liquids. This technique has a relatively simple experimental setup and produces AgNPs of high purity. The generation of SERS Substrates from AgNPs created by laser ablation of silver granules in clean water is the subject of this research. Here, the optimal parameters were identified by determining the laser energy, pulse repetition frequency, and ablation duration effects on the Surface Plasmon Resonance peak of AgNPs solutions that was centered around 404 nm. The generated AgNPs solutions were taken for Raman measurements. The prominent bands were centered around 196, 640, 824, 1060, and 1538 cm-1 which were assigned to O=Ag2/Ag-N, C-S-C, C-H, C−CO_2ˆ-, C-N, and C=O vibration respectively. Then, the chemical stability of colloidal AgNPs produced was investigated and noted to be stable over the first 8 days. Finally, SERS substrates were applied to the blood. It is worth noting that these substrates enhanced the weak Raman signals of blood.

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