From Development to Detection: Dendritic Nanostructures in SERS for Advanced Biomolecular Analysis

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Surface-enhanced Raman spectroscopy (SERS) is a powerful technique that has shown great promise in the field of biomolecular detection for various applications in medical diagnostics and research [1]. By using silver sulfate as a precursor instead of silver nitrate, we developed dendritic nanostructures with sensitive SERS detection capabilities (Figure 1a). Silver sulfate acts as a growth agent and a mild capping agent, simplifying the fabrication process and enhancing substrate stability. We integrated these dendritic nanostructures with electrochemistry to create a platform for the potential-dependent SERS analysis of biological molecules. As an example, we have utilized dendritic structures to detect and analyze DNA tagged with an alkyne molecule. The significance of the alkyne tag lies in its location within the biologically silent region of the Raman spectra. We leveraged 2D correlation-based analysis [2] to study the effective changes in the Raman mode of DNA bases and the alkyne tag (Figure 1b). In future work, we will focus on bioanalytical detection schemes employing this SERS platform in clinical-relevant research, highlighting the potential of dendritic nanostructures in enhancing the sensitivity in SERS applications and their analysis in the complex sample matrices.

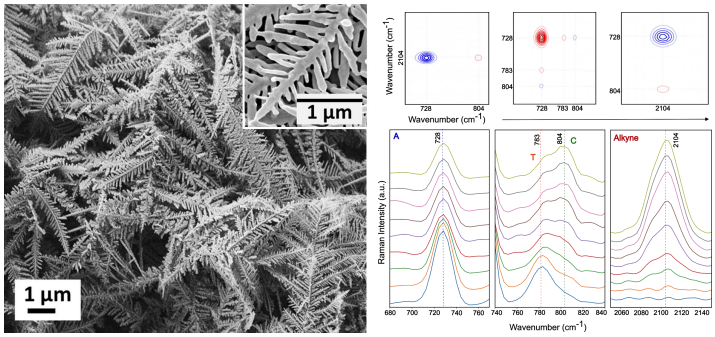

Figure 1: a) SEM image of as synthesized dendritic nanostructures, b) 2D correlation analysis and related spectral changes in the alkyne tagged DNA.

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References

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