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Paper based Flexible and Conformal SERS Substrate for Rapid Trace Detection on Real-world Surfaces¹ SRIKANTH SINGAMANENI, CHANG LEE, LIMEI TIAN, Washington University in St. Louis — One of the important but often overlooked considerations in the design of surface enhanced Raman scattering (SERS) substrates for trace detection is the efficiency of sample collection. Conventional designs based on rigid substrates such as silicon, alumina, and glass resist conformal contact with the surface under investigation, making the sample collection inefficient. We demonstrate a novel SERS substrate based on common filter paper adsorbed with gold nanorods, which allows conformal contact with real-world surfaces, thus dramatically enhancing the sample collection efficiency compared to conventional rigid substrates. We demonstrate the detection of trace amounts of analyte (140 pg spread over 4 cm²) by simply swabbing the surface under investigation with the novel SERS substrate. The hierarchical fibrous structure of paper serves as a 3D vasculature for easy uptake and transport of the analytes to the electromagnetic *hot spots* in the paper. Simple yet highly efficient and cost effective SERS substrate demonstrated here brings SERS based trace detection closer to real-world applications.

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