SERS-active Nano structure for biomolecule detection

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We here present an optofluidic surface enhanced Raman spectroscopy (SERS) device for on-chip detection of vasopressin using an aptamer based binding assay. To create the SERS-active substrate, densely packed, 200 nm diameter, metal nanotube arrays were fabricated using an anodized alumina nanoporous membrane as a template for shadow evaporation. We explore the use of both single layer Au structures and multilayer Au/Ag/Au structures and also demonstrate a facile technique for integrating the membranes with all PDMS microfluidic devices. Using the integrated device, we demonstrate a linear response in the main detection peak intensity to solution phase concentration and a limit of detection on the order of 50 ng/mL. This low limit of detection is obtained with device containing the multilayer SERS substrate which we show exhibits a stronger Raman enhancement while maintaining biocompatibility and ease or surface reactivity with the capture probe.