Nano/microfluidic platforms for biosensing applications

Amy Shen
Okinawa Institute of Science and Technology Graduate University, Japan
Amy.shen@oist.jp

Fabricating large-scale bioplasmonic materials at high-throughput is important for the development of bio/chemical sensors and high resolution nanomaterial based bioimaging tools. However, techniques specific to large-scale synthesis of biocompatible nanoplasmonic materials have found limited acceptance in industry due to their time-consuming and complex fabrication procedures. Here, by exploiting properties of reactive ions in a SF_6 plasma environment, we assemble nanoplasmonic substrates containing mushroom-like structures with SiO_2 (insulator) stems and metal caps of gold (45-60 nm in total height, ~20 nm in width), evenly distributed with ~10 nm spacing on a glass slide. We demonstrate that our developed gold nanomushroom (Au NM) substrate is biocompatible and sensitive for localized surface plasmon resonance (LSPR) based biosensing applications, achieving a limit of detection of 66 zM for small molecules [1]. In addition, this platform is exploited to monitor mitosis of fibroblasts for 7 days [2], E. coli biofilm formation and drug screening [3], and DNA polymerase activity in real-time [4].

References

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