# ALUMINUM-BASED PLASMONIC NANOSTRUCTURE FOR BIOSENSING

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Aluminum-based localized surface plasmon resonance (LSPR) holds attractive properties including low cost, high natural abundance, and ease of processing by a wide variety of methods including complementary metal oxide semiconductor process, making it superior to conventional LSPR involving noble metals. It has great potential to be developed into large-scale arrays composed of highly miniaturized and uniform signal transducer elements, thereby widely used in the terminals of mobile healthcare, public health security and environmental monitoring.

In this presentation, we present an overview of our recent work on using aluminum nanostructured materials with LSPR for biosensing. Firstly, we introduce an aluminum nanopyramid array (NPA) with tunable ultraviolet-visible-infrared wavelength plasmon resonances. The Al NPA holds high RI sensitivity which is even comparable with that of noble metal, and can be used as a biosensor for rapid detection of carbohydrate antigen 199 (a biomarker specific to cancer exists in the digest system), with limit of detection determined to be 29 ng/mL. Secondly, we present a low-cost replication technique is introduced for the mass production of NPA. The method we developed has great potential in industrial production. Last, we apply the plasmonic nanostructures to real-time monitor the concentration change of hydrogen ion in saliva, and to rapidly determine the blood type and concentrations of red blood cells in human blood.

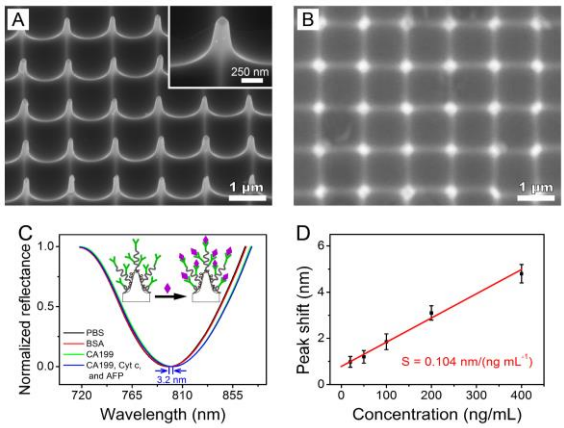


*Fig. 1. Al NPAs. (A) the side view and (B) the top view of the aluminum NPA. The inset in (A) is a magnification image of a typical NPA. (C) Representative reflectance spectra for detecting CA199 on the anti-CA199 modified Al nanopyramid by specific interaction; the antibody-functionalized Al NPA was incubated in PBS (pH 7.2), BSA (3.0 wt.%) solution, CA199 (200 ng/mL) solution, and a mixture solution containing CA199 (200 ng/mL), Cyt c (10 μM), and AFP (200 ng/mL). (D) Relationship between the dip shift and the CA199 concentration. The inset in (C) illustrates the direct detection of CA199 via immunobinding on antibody functionalized Al NPAs.*

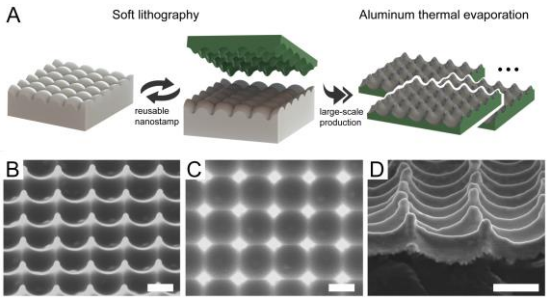


*Fig. 2. Schematic illustration of the fabrication procedure of Al NPA nanostructures by ESL and subsequent Al deposition. The elastic nanostamp is molded from a NPA fabricated through EBL and electrochemical etching, and used repeatedly for high throughput of NPA substrates composed of transparent polymer and Al nanostructures.*

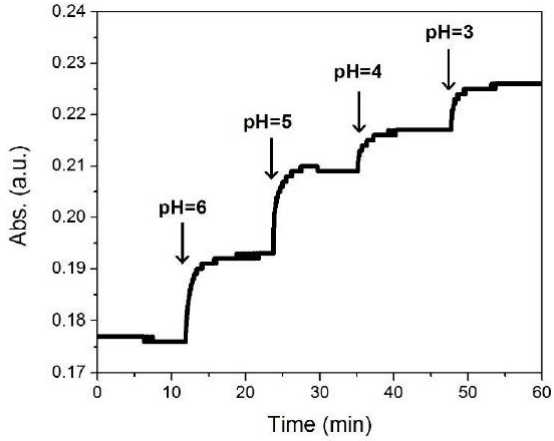


*Fig. 3. The real-time pH monitoring of a saliva sample (from a normal person) using a PANI-GNPs-glass biosensor.*

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