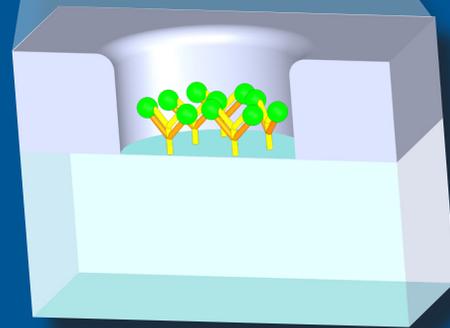
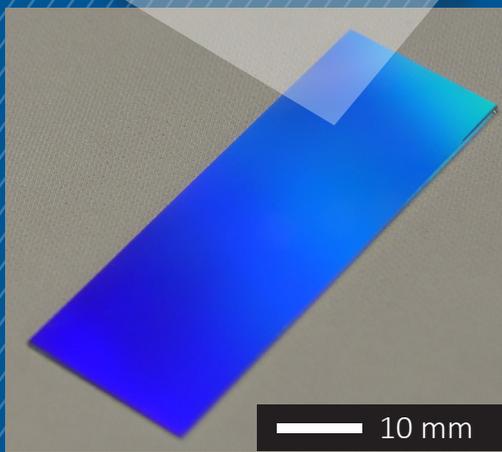
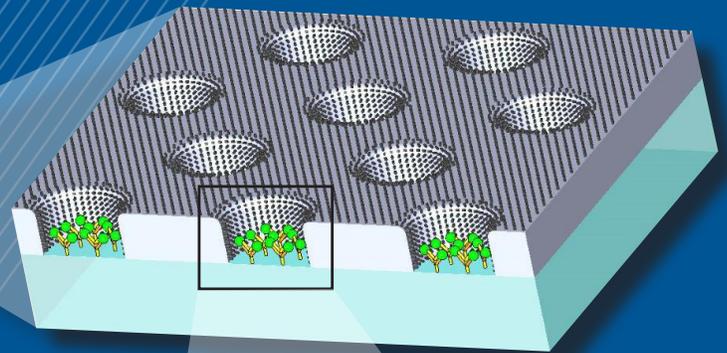
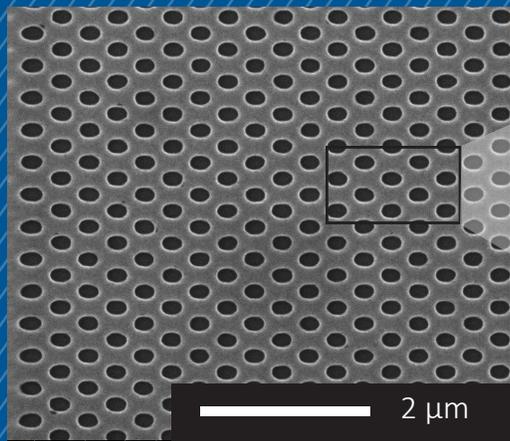


Biosensor

Substrate Technology



Available in limited supply. Please contact us at info@moxtek.com for details.

Tunable Nanostructured Biochip Substrates for Enhanced Detection

Overview

Fluorescence and label free based detection methods serve as very effective means to identify and detect literally any biomolecule of interest. Though very useful, both methods offer relatively low signal to noise ratios (SNRs). By incorporating metallic nanostructures, which provide highly focused and enhanced optical fields, one can boost the SNR by several orders of magnitude, thereby resulting in a highly enhanced fluorescence response. Furthermore, nanofocusing of the light at the metallic surface allows for label free sensing of target biomolecules. Building on years of expertise, Moxtek has developed inexpensive and reliable methods to obtain uniform wafer scale metallic and dielectric nanostructures that can be used as Biochips for these applications. Additionally, our nanofabrication expertise at Moxtek allows us to also provide numerous photonic crystal based structures.

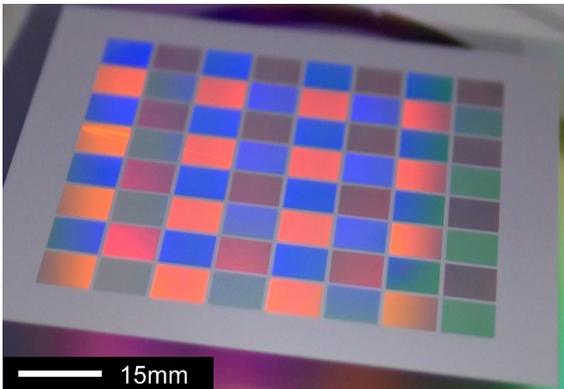


Fig. 1. A repeating grid of 4 different Moxtek aluminum nanohole arrays, demonstrating both pixelation and multi color detection possibilities over the entire UV to near-IR spectrum.

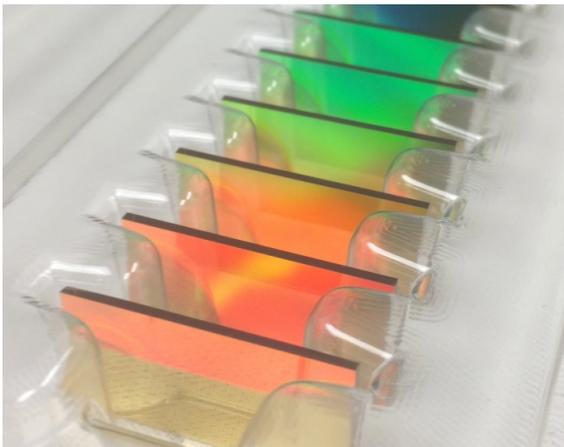


Fig. 2. Various moxtek plasmonic arrays.

Advantages

Moxtek's nanostructured substrates make an ideal biochip sensor platform, offering:

- Highly focused light fields within the sensing regions
- Strong localization of the enhancement
- Millions of distinct sensing regions per chip

Results

- Greater signal to noise ratios
- Vast multiplexing possibilities
- Higher throughput
- Lower reagent volumes
- Faster response times
- More reliable results

Product Description

Building on existing lithographic capabilities in wafer-scale patterning of sub-wavelength wire grid polarizers, Moxtek fabricates a wide variety of uniform periodic aluminum and dielectric nanostructures, such as nanopost arrays, nanohole arrays, 1D/2D photonic crystal structures, and also hybrid photonic crystal/plasmonic structures. Typically, fabrication of such structures requires the use of expensive tools such as ebeam or FIB. Our methods are focused on wafer scale manufacturing, thereby allowing us to provide numerous types of nanostructured substrates with millions of individual sensing regions at a very affordable cost.

Product Description

The structures exhibit plasmonic localization and thus a very strong enhancement of the illuminating light source, which is highly useful for surface enhanced fluorescence sensing (SEFS) and for surface plasmon resonance (SPR) label free sensing. Furthermore, our fabrication technology allows us to easily vary numerous structural parameters. This can very clearly be seen in figs. 3 and 4 where SEM images from a large variety

of our fabricated nanopost and nanohole arrays are shown. Such variation of the structural parameters allows not only for a very large spectral tuning of the optical response, but also a tuning of the strength and spatial distribution of the optical enhancement to suit your application.

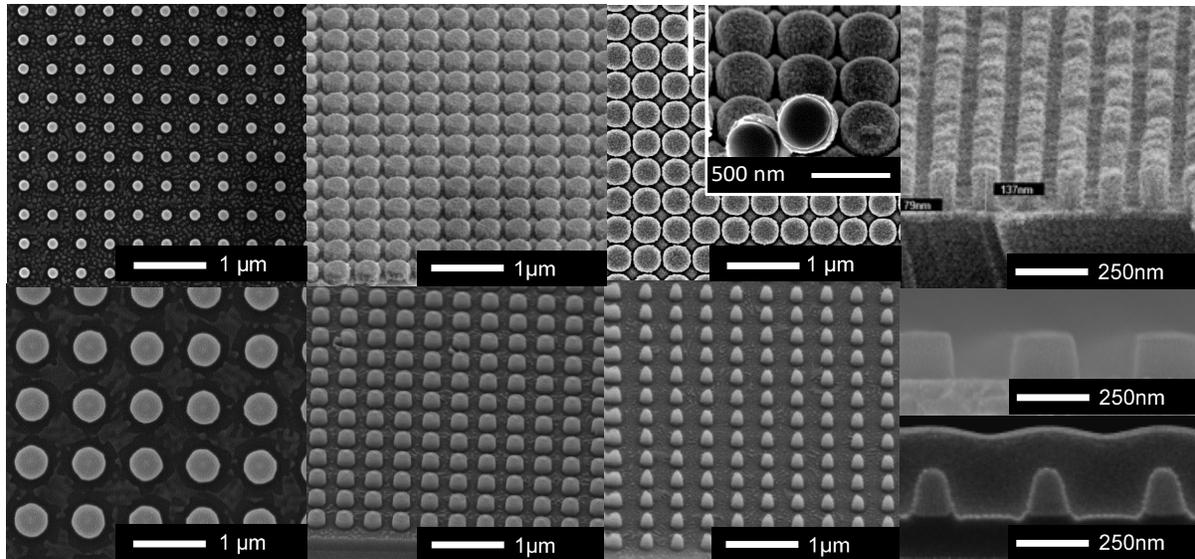


Fig. 3. A variety of nanopost arrayed metallic and dielectric structures fabricated at Moxtek, demonstrating the range of fabrication capabilities available.

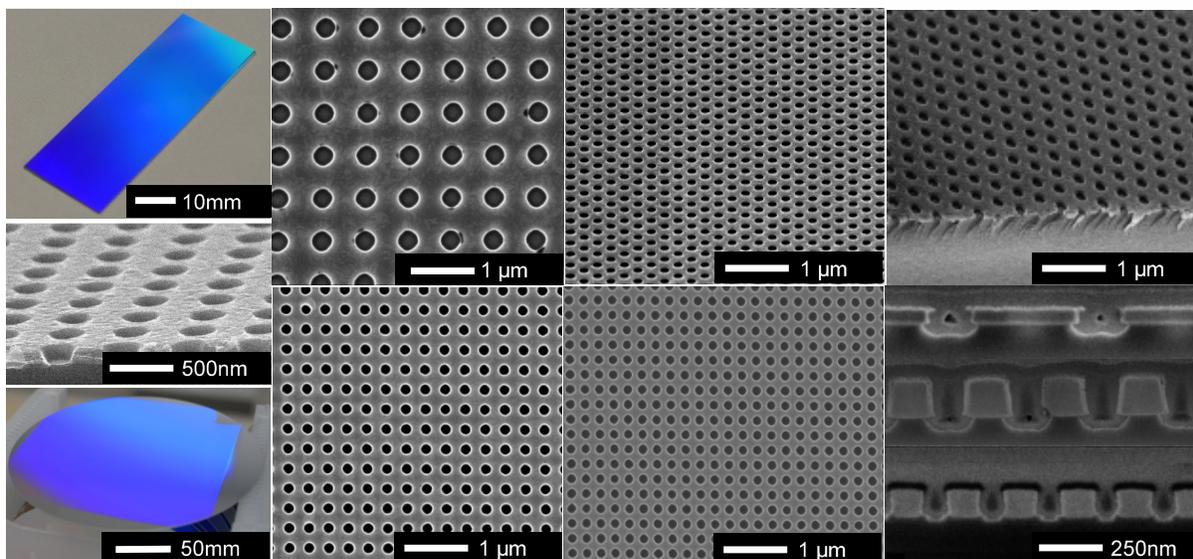


Fig. 4. A variety of metallic and dielectric nanohole arrays fabricated at Moxtek, demonstrating the various pitch and hole geometries possible.

Biosensors Product Capability

	Nanohole Arrays (Square or Hexagonal Array)	Photonic Crystals (Linear, Square, or Hexagonal Array)	NanoPost Arrays (Square or Hexagonal Array)
Resonant Wavelengths	Approx. 200 nm - 1600 nm	Approx. 405 nm - 1600 nm	Approx. 200 nm - 1600 nm
Period	Approx. 180 nm - 700 nm (both X & Y)	144 nm & Approx. 180 nm - 700 nm	Approx. 180 nm - 700 nm (both X & Y)
Critical Dimension (Feature Size)	Hole Diameter Approx. 70 nm - 300 nm Diameter range depends on period.	Duty Cycle (grating fill factor): 30%-55%	Post Diameter Approx. 70 nm - 300 nm Diameter range depends on period.
Height or thickness	Approx. 20 nm - 250 nm	Approx. 20 nm - 250 nm	Approx. 35 nm - 250 nm
Current Materials	Aluminum, SiO ₂	SiO ₂ , TiO ₂	Aluminum, SiO ₂
Possible Materials	Al ₂ O ₃ , TiO ₂ , TaO ₂ , Si ₃ N ₄ , and other oxides and nitrides. Polymers such as PMMA. Semi-metals and Metals such as Silicon, Germanium, Titanium, Tungsten, and Tantalum.	Al ₂ O ₃ , TaO ₂ , Si ₃ N ₄ , and other oxides and nitrides. Polymers such as PMMA.	Al ₂ O ₃ , TiO ₂ , TaO ₂ , Si ₃ N ₄ , and other oxides and nitrides. Polymers such as PMMA. Semi-metals and Metals such as Silicon, Germanium, Titanium, Tungsten, and Tantalum.
Surface Treatments	Epoxy-silanes and aldehydes, various anti-corrosion or surface passivation layers, SiO ₂ , Oxygen Plasma Ash, UV-Ozone, Al ₂ O ₃ , HfO ₂	Epoxy-silanes and aldehydes, various anti-corrosion or surface passivation layers, SiO ₂ , Oxygen Plasma Ash, UV-Ozone, Al ₂ O ₃ , HfO ₂	Epoxy-silanes, various anti-corrosion or surface passivation layers, SiO ₂ , Oxygen Plasma Ash, UV-Ozone, Al ₂ O ₃ , HfO ₂
Substrate	Glass (Corning Eagle), Fused Silica, Silicon, certain near-IR materials	Glass (Corning Eagle), Fused Silica, Silicon, certain near-IR materials	Glass (Corning Eagle), Fused Silica, Silicon, certain near-IR materials
Substrate Thickness	0.7 mm - 1.0 mm standard	0.7 mm - 1.0 mm standard	0.7 mm - 1.0 mm standard
Part Size	Custom from 200 mm wafer down to 5 mm x 5 mm	Custom from 200 mm wafer down to 5 mm x 5 mm	Custom from 200 mm wafer down to 5 mm x 5 mm
Comments	Suitable for wet or dry applications, microarrays with standard Cy3 and Cy5 fluorescence or similar, Surface Plasmon Resonance (SPR) detection enhancement, fluorescent & label free detection, and nanoparticle capture.	Suitable for wet or dry applications, microarrays with standard Cy3 and Cy5 fluorescence or similar, Guided Mode Resonance enhancement of fluorescent or label-free detection.	Resonant Fluorescence and Phosphorescence enhancement. Colorimetric based sensing.

