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Research Highlights

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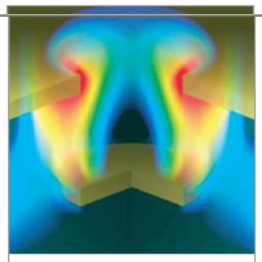
Subject Category: Nanosensors and other devices

Nanostructures: Making better sense

Ai Lin Chun

Arrays of cylindrical nanowells can now image molecular binding events with high sensitivity over large areas



Surface plasmon resonance (SPR) is a popular technique for measuring binding interactions such as those between DNA and proteins based on changes in refractive index near a metal surface. Although metal nanostructured films and nanoparticles can be used for SPR type sensing, fabricating large-area and spatially coherent arrays of uniform nanostructures with good sensitivities is expensive.

Now, researchers at the University of Illinois, Urbana-Champaign and Argonne National Laboratory in the US have developed a low-cost crystal array to make a highly sensitive sensor. Ralph Nuzzo, John Rogers and co-workers[1] created a periodic three-dimensional array of cylindrical gold-coated wells, known as plasmonic crystals, using soft nanoimprint lithography — a technique that uses a soft polymeric mold to stamp and create structures on a substrate. It was shown experimentally and theoretically that the tiny (20–30 nm) grains of gold along the sidewalls of the nanowell crystals were necessary for increased sensitivities in the SPR measurements.

When tested with proteins, binding events could be detected with sensitivities down to a single layer. The high degree of spatial uniformity of the crystals also allows binding events to be imaged over a large area. The sensor could be integrated into a portable microfluidic device for miniaturized analytical instrumentation of the future.

REFERENCES

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1. Stewart, M. E. *et al.* Quantitative multispectral biosensing and 1D imaging using quasi-3D plasmonic crystals. *Proc. Natl Acad. Sci. USA* **103,** 17143–17148 (2006).

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