Imec reports asymetric nanostructures for early and more accurate prediction of cancer

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Researchers at the nanotechnology research center Imec (Belgium) have demonstrated biosensors based on novel nanostructure geometries that increase the sensitivity and allow to detect extremely low concentrations of specific disease markers. This paves the way to early diagnostics of for example cancer by detecting low densities of cancer markers in human blood samples.

Functionalized nanoparticles can identify and measure extremely low concentrations of specific molecules. They enable the realization of diagnostic systems with increased sensitivity, specificity and reliability resulting in a better and more cost-efficient healthcare. And, going one step further, functionalized nanoparticles can help treat diseases, by destroying the diseased cells that the nanoparticles bind to.

Imec aims at developing biosensor systems exploiting a phenomenon known as localized surface plasmon resonance in noble metal (e.g. gold and silver) nanostructures. The biosensors are based on optical detection of a change in spectral response of the nanostructures upon binding a disease marker. The detection sensitivity can be increased by changing the morphology and size of the noble metal nanostructures.

The biosensor system is cheap and easily extendable to multiparameter biosensing. Imec today presents broken symmetry gold nanostructures that combine nanorings with nanodiscs. Combining different nanostructures in close proximity allows detailed engineering of the plasmon resonance of the nanostructures. More specifically, imec

targeted an optimization of both the width of the resonance peak and the resonance shift upon binding of the disease marker. With respect to these parameters, the new geometries clearly outperform the traditional nanospheres. Therefore, they are better suited for practical use in sensitive biosensor systems.

“With our bio-nano research, we aim at playing an important role in developing powerful healthcare diagnostics and therapy. We work on innovative instruments to support the research into diseases and we look into portable technologies that can diagnose diseases at an early stage. We want to help the pharmaceutical and diagnostic industry with instruments to develop diagnostic tests and therapies more efficiently;” said Prof. Liesbet Lagae, program manager HUMAN++ on biomolecular interfacing technology.

Some of these results were achieved in collaboration with the Catholic University of Leuven (Leuven, Belgium), Imperial College (London, UK) and Rice University (Houston, Texas).

Source: IMEC