[P2.171]

Surface plasmon based biosensor in silicon-on-insulator: Design, fabrication and characterisation

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While Surface Plasmon Resonance (SPR) is a well known, very sensitive transduction technique for biomolecular sensing, practical devices are bulky, require precision optics, often require calibration and are expensive. Integration of the SPR transduction principle with conventional dielectric waveguides could solve these issues, but only integration with low-index waveguides has been suggested so-far.

We suggest a novel transduction scheme based on the interference produced by two surface plasmon modes propagating on either side of a thin gold film. We have integrated surface plasmon waveguides with Silicon-on-Insulator (SOI) waveguides and discuss the principle of a highly sensitive and compact surface plasmon interferometric sensor suitable for biosensing. The device is two orders of magnitude smaller than current integrated SPR sensors, and has a highly customizable behaviour. We obtain a theoretical limit of detection of 10^{-6} RIU for a component of length 10 μm, in good agreement with the literature stated and required limit of 10^{-6} for biomolecular sensing. We address material issues and fabrication tolerances for this device. A first generation of devices has been fabricated using deep-UV-lithography. Proof-of-Principle for surface plasmon interference has been obtained, proving the potential of these devices.

Silicon-on-Insulator is a very interesting material system for fabricating highly integrated photonic circuits. The high refractive index contrast allows photonic waveguides and waveguide components with submicron dimensions to guide, bend and control light on a very small scale so that various functions can be integrated on a chip. Due to the CMOS industry silicon technology has reached a level of maturity that outperforms any other plane chip manufacturing technique by several orders of magnitude in terms of performance, reproducibility and throughput. From a financial point of view, due to high integration and moderate wafer price the price per chip can be very low.

Keywords: Surface Plasmon, Silicon-on-Insulator

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Large scale integrated CMOS-magnetic tunnel junction arrays for the detection of bio molecules labelled with magnetic particles

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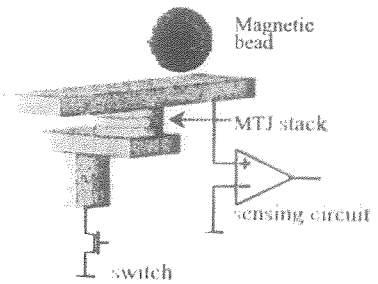
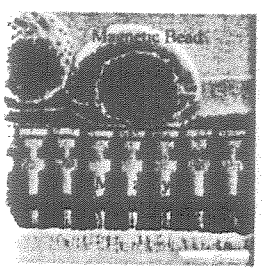
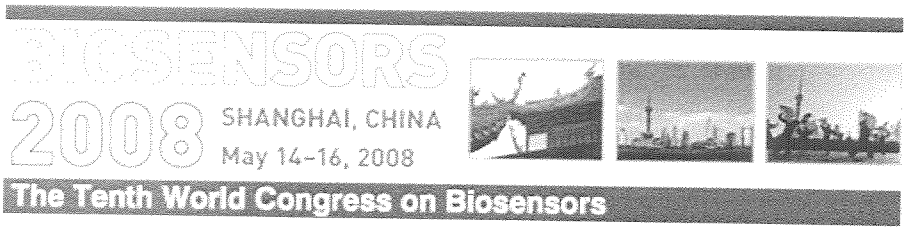
A chip of magnetic tunnel junction (MTJ) arrays integrated with CMOS control circuit has been studied to detect bio molecules tagged with micro magnetic particles. On the chip is an array of one million submicron MTJ devices spaced one micron apart. Under the MTJ arrays is the CMOS circuit fabricated with 180 nm technology on 8-inch wafers. The CMOS control circuit can access and evaluate the content of any single MTJ device in any sequence. The magnetic particles used for this study are the Dynal M-280 and the MyOne micro-spheres. After the magnetic particles are dropped on the surface of the chip, a DC magnetic field in the direction perpendicular to the chip surface is applied, and the resistance of each MTJ device is evaluated. If there are magnetic particles in the vicinity of a MTJ, the stray magnetic field from the magnetic particles will be sensed by the MTJ and tell the existence of these particles. If there are no magnetic particles near a MTJ, the applied magnetic field has no effect on the MTJ.

After all MTJs of interest are evaluated, a software program is used to map out the magnetic particles on the chip's surface and reports the test results. Information in the results includes a two dimensional map of magnetic particles in any specific area of interest and the total number of magnetic particles in the area. For Dynal M-280 particles, 99% of the particle population is accounted for. For the MyOne particles, 90% is precisely detected.

This technology is being developed as a high sensitivity and high speed detection platform to detect all bio substances which can be tagged by magnetic particles and can be hybridized onto the chip surface.







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Location

Shanghai, China

Biosensors 2008 will take place at the Shanghai International Convention Centre. Shanghai lies in central-eastern China on the East China Sea and is China's largest city with a population of 17 million. Central Shanghai is divided into two areas: Pudong (east of the Huangpu River) and Puxi (west of the river), home to most tourist attractions including the Bund.

Today the city continues to grow apace, with a new airport, new underground stations, highways, the most modern stock exchange in the world and a whole new modern city in Pudong. There is much to see in Shanghai including the Bund, its riverside area, and Frenchtown, temples, gardens, bazaars and the striking architecture of the new Shanghai. Well known among the Chinese as *the* place to shop in China, ever since the 1930s the city has been home to the cream of China's department stores and today Shanghai is fast rivalling Hong Kong as a shopper's heaven. Shanghai offers a dazzling array of food with numerous restaurants offering all styles of Chinese and international cuisine.

Time Zone
All of China is set to Beijing time, GMT+8. China is 16 hours ahead of US Pacific Time, 13 hours ahead of US Eastern Standard Time and 8 hours ahead of Greenwich Mean Time.

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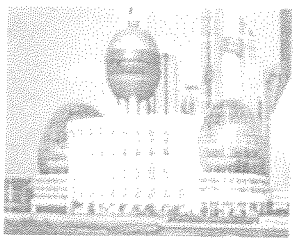

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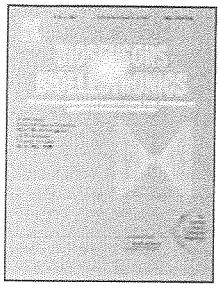

modern transportations. The center was completed and officially opened for business in August 1999, covering a construction area of 110,000 m^2. As the new landmark of Shanghai, the center was appraised as one of the 10 classic buildings over the 50 years since the founding of the P.R. China. The Riverside Oriental Hotel is located in the Shanghai International Convention Center.

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L. Jing*[1], Z. Zhiping[1,2], *[1]Huazhong University of Science and Technology, China, [2]Georgia Institute of Technology, USA*

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B. Iafelice*[1,2], L. Rambelli[1], D. Gazzola[1], L. Giulianelli[1], R. Guerrieri[1], *[1]ARCES – University of Bologna, Italy, [2]Fraunhofer IZM, Germany*

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I. Murkovic Steinberg*[1], M. Rehak[2], M.D. Steinberg[2], *[1]University of Zagreb, Croatia, [2]Erasmus Technology LLP, UK*

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