voltage-gated potassium or chloride channels. Cells were cultured on n- and p-channel field-effect transistors to compare the influence of the device type on the signal shape. The signals of the active ion channels of the whole cell and those in the contact region on the transistor gate are examined using electrophysiological techniques.

HL 48.3 Di 11:45 TU P270

Detecting DNA Hybridization by a Microfabricated Field-effect Sensor — •Jürgen Fritz — MIT Media Laboratory, 20 Ames Street, Cambridge, MA 02139, USA. — present adress: International University Bremen, Campus Ring 1, 28759 Bremen, Germany

Detecting the presence and activity of biomolecules by electronic means is of growing interest due to its potential to simplify and miniaturize biosensors or medical devices. Label-free electronic detection of biomolecules with a microfabricated device offers the advantage of online-monitoring of biological samples and processes, and miniaturization and parallelization of sensors into arrays by using standard microfabrication techniques. One route to achieve electronic detection of biomolecules is to detect the intrinsic molecular charge of biomolecules by a field-effect device. Here we report on a microfabricated field-effect sensor which detects the binding of short DNA molecules to its sensor surface 1. We show functionalization strategies for such a sensor, and concentration dependence and specificity of the sensor signal. We summarize field-effect detection of biomolecules, show its promises, limits, and future applications.

HL 48.4 Di 12:15 TU P270

A BioFET on the basis of intact insect antennae — •M. J. Schöning[1,2], S. Schütz[3], H. E. Hummel[4], H. Lüth[2], and C.-D. Kohl[5] — [1]Fachhochschule Aachen (Abteilung Jülich), Labor für Chemo- und Biosensorik — [2]Forschungszentrum Jülich, ISG — [3]Universität Göttingen, Fakultät für Forstwissenschaften und Waldökologie — [4]Universität Giessen, Institut für Phytopathologie und Angewandte Zoologie — [5]Universität Giessen, Institut für Angewandte Physik

More than one million species of insects with sometimes extraordinary sensory abilities present a tremendous potential of highly optimised chemoreceptors. To make these abilities usable for analytical tools, some interface between chemoreceptive organs of insects and microelectronic components of analytical instruments has to be established. One promising possibility is the design of biosensors on the basis of intact chemoreceptors utilising electrophysiological techniques, like electroantennography (EAG). For natural analyte concentrations the EAG responses have a rise time of 50 ms and a time constant for decay of about 200 ms. In order to circumvent, major drawbacks of conventional EAG methods such as electrical and mechanical instability, the need for pre-amplification and the limited ability for miniaturisation, we designed a direct field effect transistor (FET)-insect antenna junction, representing the first BioFET on the basis of intact insect antennae. Two different set-ups will be presented the whole-beetle BioFET and the isolated-antenna BioFET. Considering that detection limits of analytes are typically in the ppb range or even lower, a biosensor on the basis of intact chemoreceptors could serve as an analytical device with unrivalled data acquisition time.

HL 48.5 Di 12:45 TU P270

Biosensor Applications of AlGaN/GaN Solution Gate Field Effect Transistors — •Georg Steinhoff, Barbara Baur, Martin Stutzmann, and Martin Eickhoff — Walter Schottky Institut, Technische Universität München, Am Coulombwall 3, D-85748 Garching

AlGaN surfaces are chemically inert in aqueous solutions and non-toxic to living cells. Covalent functionalization with self assembled monolayers (SAMs) of APTES for the immobilization of single stranded oligonucleotides and of ODTMS for the subsequent deposition of lipid monolayers is possible, allowing label-free detection of DNA hybridization or the detection of ligand binding to specific receptors in lipid monolayers on functionalized gates of solution gate AlGaN/GaN heterostructure field effect transistors. A different approach for the realization of biosensors is the cultivation of living cells directly on the gate area and the measurement of their ionic response to chemical or physical stimuli. We systematically studied the electronic characteristics of AlGaN/GaN FET arrays for the detection of electrical cell signals, such as low-frequency noise, transconductance and the sensitivity towards specific ions. Extracellular action potential recordings from a confluent layer of rat heart muscle cells cultivated directly on the non-metallized gate surface are discussed.

HL 49 Photonische Kristalle II

Zeit: Dienstag 10:45–13:15 Raum: TU P164

HL 49.1 Di 10:45 TU P164

Nonlinear optical experiments on waveguide plasmon polaritons using 5fs pulses — •Matthias W. Klein[1], Thorsten Tritschler[1], Stefan Linden[2], and Martin Wegener[1] — [1]Institut für Angewandte Physik, Universität Karlsruhe (TH), Wolfgang-Gaede-Straße 1, 76131 Karlsruhe, Germany — [2]Institut für Nanotechnologie, Forschungszentrum Karlsruhe in der Helmholtz-Gemeinschaft, 76021 Karlsruhe, Germany

We present improved experiments and theoretical modeling of the linear and third-harmonic (TH) optical response of particle plasmons coupled resonantly to a slab waveguide. Our samples consist of lithographically patterned gold stripes on top of a HfO_2 waveguide. This system shows an avoided crossing in linear optics [1] and first nonlinear experiments have been presented [2]. In our experiment we use 5fs pulses from a Ti:Sa oscillator and resolve the TH signal both temporally *and* spectrally. The TH signal exhibits a pronounced beating versus time delay for specific spectral components, an exponential decay for other components, and shows evidence of partial destructive interference. The data fit very well to our theoretical model based on two coupled Lorentz oscillators, which also explains Fano-like lineshapes in the linear spectra. Moreover, we analytically show that the determination of the homogeneous linewidth of particle plasmon ensembles via second or third-harmonic generation experiments is *not* possible, thus contradicting Ref. [3].

[1] A. Christ et al., Phys. Rev. Lett. **91**, 183901 (2003)
[2] T. Zentgraf, A. Christ, J. Kuhl, and H. Giessen, submitted (2004)
[3] B. Lamprecht et al., Appl. Phys. B **69**, 223 (1999)

HL 49.2 Di 11:00 TU P164

Dispersion properties of coupled modes in photonic crystal waveguides — •Alexander Petrov and Manfred Eich — TU Hamburg-Harburg, AB 4-09, Eissendorfer Strasse 38, D-21073 Hamburg, Germany

The power flow redistribution in photonic crystal line-defect waveguides can lead to the appearance of modes with very small group velocities away from the Brillouin zone edge. There are also modes with the power flow distribution similar to the one of conventional dielectric waveguides, these modes propagate with normal group velocities. High values of dispersion can be obtained when different frequencies propagate with different group velocities. This can be achieved by coupling of two different modes in a single waveguide or between two parallel waveguides. Several designs are investigated with band diagrams and time domain simulations. Several hundred ps/nm/mm dispersion without third order dispersion is predicted on the bandwidth of a single wavelength division multiplexing channel.

HL 49.3 Di 11:15 TU P164

Coupled Resonator Optical Waveguides (CROWs) Doped With Nanocrystals — •Björn M. Möller[1], Mikhail V. Artemyev[2], Reinhold Wannemacher[3], and Ulrike Woggon[1] — [1]University of Dortmund — [2]Belarussian State University, Minsk — [3]Universität Leipzig

In this contribution, we study CdSe-doped microspheres of radii between two and four optical wavelengths as building blocks for coupled resonator optical waveguides (CROWs) [1]. Unlike other types of optical waveguides, waveguiding through CROWs is achieved through weak coupling between otherwise localized high-Q optical cavities. The coherently coupled microsphere cavities were prepared by impregnating polystyrene microspheres with a subsurface layer of CdSe nanocrystals [2]. Exactly size-matched microspheres (< 0.1 % size deviation) have been pre-selected via their Mie resonances. The coupled cavities, arranged in linear chains and various two-dimensional geometries are studied by microphotoluminescence spectroscopy and polarization sensitive mode mapping [3]. Waveguides consisting of more than five coherently coupled cavities with radii around 2.25 μm have been achieved.