

Kolloquium

Am **Donnerstag, den 22. Februar 2018**, um **13:00 Uhr** hält

Dr.habil. Didier Théron / IEMN, CNRS, Université Lille, France

einen Vortrag zum Thema

„Microwave nanoprobing station with MEMS probes for characterisation of InAs nanowires and SMM characterisation of nanodot molecular junctions“

Der Vortrag findet in A1 3-330 statt.

Abstract:

With the miniaturization of electronic circuits, new measurement and metrological issues are emerging combining contacting nanoscale devices and calibration of microwave frequency instrumentation. This concerns in particular nanoelectronic devices such as attoFarad capacitors, nanoscale contacts, 1D and 2D based devices. In the frame of the “EXCELSIOR” Project and in cooperation with AMIR group in Oldenburg, new hybrid measuring equipment combining guided radio frequency (RF) probing, nanorobotics and scanning electron microscopy (SEM) is demonstrated for tackling the frontiers between spatial resolution and frequency domain [1]. This should lead to unprecedented capabilities for nanoscale material and device analysis. As an application, measurement of InAs nanowires will be shown [2].

Another way for nanoscale analysis at microwave frequencies is Scanning Microwave Microscopy (SMM) where microwave analysis is coupled to atomic force microscopy [3-6]. Here, our work focuses on the characterization in the 2 -18 GHz range of nanostructures specifically designed for SMM. These structures are based on Au nanodot arrays used to graft small quantities of molecules and analyse their electrical characteristics. Nanodots without molecules were characterized at 7.8 GHz using reference MIS capacitances for calibration. The parasitic capacitance between the probe and the sample is modelled and successfully deembedded. Then, 11-Ferrocenyl-1-undecanethiol (FcC11SH) molecules grafted on nanodots are measured at 3.8 and 17 GHz. The rectifying behaviour of the FcC11SH is evidenced showing the potential use of these molecules for high frequency diodes with cut-off frequency of about 500 GHz.

1. J. Marzouk, S. Arscott, A. El Fellahi, K. Haddadi, C. Boyaval, S. Lepilliet, T. Lasri, G. Dambrine, Sens. Actuator A-Phys. 238 51-59 (2016)
2. K. Daffe, J. Marzouk, A. El Fellahi, T. Xu, C. Boyaval, S. Eliet, B. Grandidier, S. Arscott, G. Dambrine and K. Haddadi, Proc. 47th EuMC, Nuremberg, Germany, Oct. 2017
3. A. Imtiaz, T. M. Wallis and P. Kabos, IEEE Microwave Magazine 15 (1), 52-64 (2014).
4. G. Gramse, E. Brincotti, A. Lucibello, S. B. Patil, M. Kasper, C. Ranki, R. Giridharagopal, P. Hinterdorfer, R. Marcelli and F. Kienberger, Nanotechnology 26, 135701 (2015).
5. S. Berweger, G. A. MacDonald, M. Yang, K. J. Coakley, J. J. Berry, K. Zhu, F. W. DelRio, T. M. Wallis and P. Kabos, Nano Letters 17 (3), 1796-1801 (2017).

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6. Y. J. Oh, H.-P. Huber, M. Hochleitner, M. Duman, B. Bozna, M. Kastner, F. Kienberger and P. Hinterdorfer, *Ultramicroscopy* 111 (11), 1625-1629 (2011).

Brief biography:

Didier THERON is researcher director at CNRS and works at Institute of Electronics, Microelectronics and Nanotechnology (IEMN). He defended his Habilitation thesis in 1998 at the University of Sciences and Technology of Lille. The same year, he received the CNRS Bronze medal for his work on the physics and technology of power HEMTs for millimetre wave applications. In 2006, he merged his competences with MEMS physics and applications for the investigation of GaN MEMS resonators as well as Si MEMS resonators for AFM probes. In 2009, in collaboration with Keysight Technologies, he developed expertise on Scanning Microwave Microscopy coupled to RF interferometry for the investigation of aF-scale capacitance on Au nanodots and Ferrocenealkanethiol based devices. He has about 83 peer-reviewed papers and 80 peer-reviewed communications in conferences (12 invited) and 2 patents. From September 2013 to December 2015, he headed the Nano And MicroSystems (NAM6) group of IEMN. He took some administrative responsibilities at CNRS from 2004 to 2008, at the national funding research organisation (ANR) from 2009 to 2012 and from 2013 at the Ministry of research.

Eingeladen von: Prof. Dr. Sergej Fatikow

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