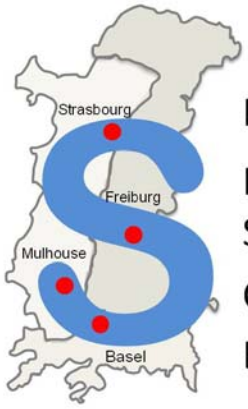

PHYSICS
MATERIALS SCIENCE
CHEMISTRY
BIOLOGY

Seminar

"IRTG: Soft Matter Science "

Near-field thermal imaging of nanostructured surfaces

Prof. Achim Kittel

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Wednesday, Oct. 27, 2010

14H00

"Hörsaal Makromolekulare Chemie", Stefan-Meier-Str. 31

UHA UNIVERSITE DE HAUTE-ALSACE Mulhouse-Colmar

UNI FREIBURG

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During this presentation, Prof. Kittel will show that a near-field scanning thermal microscope, which essentially detects the local density of states of the thermally excited electromagnetic modes at nanometer distances from some material, can be employed for nanoscale imaging of structures on that material's surface.
Every body at a finite temperature emits heat radiation. Beside the propagating modes, there exist evanescent modes, which only can contribute to the heat transfer on short distances. Their contribution to the total heat transfer overcomes the one of the propagating modes at distances well below one micrometer between two bodies. Understanding the evanescent modes and the physics of the electromagnetic fluctuations at the nanometer scale will help to understand the coupling between nanoscale particles. The new possibilities of scanning probe microscopy offer experimental access to investigate these phenomena. Heat transfer mediated by the evanescent modes is detected by means of a modified scanning tunneling microscope (STM), whose tip is functionalized as a coaxial thermocouple with dimensions in the range of a few hundred nanometers. During the measurements the temperature of the sample can be reduced to about 110K or raised to 350K while the tip holder is kept at room temperature. By this means, the heat transfer between the cooled or heated sample and the tip can be measured while scanning over the surface at the tunnel distance. The heat transfer in dependence on the distance can be studied. Methods of the experiment will be introduced and results of the measurements are presented and compared to model calculations.

Achim Kittel received his diploma degree in Physics from the Physical Institute of the University of Tübingen in 1990. In 1990 he continued with graduate studies at the University of Tübingen under the direction of Professor R.P. Hübener, receiving the Ph.D. degree in Materials Science in 1993. After 2 post-doctoral stints at the University of Bayreuth and at University of Oldenburg, Achim Kittel joined the Institute of Physics at the University of Oldenburg as senior lecturer in 2001. He gave lectures of solid states physics, physics of molecules, cryophysics and cryotechnology, superconductivity. For his habilitation, he worked on low temperature physics, solid state physics, nonlinear dynamics, chaos control, and heat transfer on the nanometer scale. Since October 1st 2010, Achim Kittel has joined the group of experimental Polymer Physics of Prof. Reiter at the University of Freiburg.