WSI successful with nextnano³ business plan – software for novel nano devices

The members of Prof. Peter Vogl's theoretical semiconductor physics group participated successfully at the "Münchener Business Plan Wettbewerb 2003" (MBPW) with their nanodevice simulator next**nano**³. Among them were Stefan Birner[1], Matthias Sabathil, Stefan Hackenbuchner, Jacek Majewski, Michael Bayer and Philip Weidmann. Their business idea is to develop software for the simulation of electronic and optical nano semiconductor devices that will enable researchers and engineers to design innovative devices based on quantum mechanical effects.

The MBPW consisted of three stages. In Stage 1 ("Ideas Creation") the physicists won the 2nd prize (250 €) within the TU Munich. In Stage 2 ("Development Stage") they were among the ten winners and received 1.250 €. Finally, they were nominated at the "Excellent Stage" and thus belonged to the most innovative business ideas of Bavaria. In addition the team was finalist at the national level of the Eurowards 2004 contest in Frankfurt ("The European Award for Entrepreneurs") and won the 4th prize (7.500 €) at Dortmund's start2grow microtechnology initiative "All micro. The Founders' Contest".

Philip Weidmann, Michael Bayer, Matthias Sabathil, Stefan Hackenbuchner and Stefan Birner (from left to right)

next**nano**³ is a simulator for calculating in a consistent manner (by solving the 8-band **k·p** Schrödinger equation, Poisson's equation and the current equations) the realistic electronic structure of three-dimensional heterostructure quantum devices under bias and their current density close to equilibrium. The electronic structure is calculated fully quantum mechanically, whereas the current is determined by employing a semi-classical concept of local Fermi levels that are calculated self-consistently. In addition there is the option to calculate the current quantum mechanically based on Greens functions. The software includes a 2D device editor to input the device geometry and a database for all III-V and group IV semiconductor materials. Its purpose is to design existing and novel nano devices in both university and industry research and to interpret experimental results by obtaining measurable quantities by means of computer simulations. Currently, it is regularly used worldwide by more than 50 university and industry customers (theoretical and experimental physicists, electrical engineers) to study the theory of these devices as well as to assist sample design or to analyze experiments. Obviously, the improvement of existing semiconductor devices and the development of devices with novel properties will be the fundamental basis of future semiconductor products in terms of performance and new applications. The software is available at www.wsi.tum.de/nextnano3.

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