

Media communiqué

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Two Master's students awarded this year's Empa Research Prize

Impressive projects on Surface and Plasma Technologies

The Empa Research Prize, first presented in 2003, was awarded on October 19th for the fourth time on the occasion of the PhD Symposium which this year as usual was organized by students completing their doctoral projects. Empa's Research Committee evaluated a number of Master's theses, doctoral dissertations and scientific publications before selecting the outstanding works of two young researchers, Ruben Maeder and Enrico Koerner for the award.

Ruben Maeder's Master's thesis entitled "Ultra-high vacuum scanning tunneling microscope (UHV-STM) and photoemission spectroscopy of the quasicrystalline d-AlNiCo two-fold surfaces" is based on work done at the Empa Thun. Roland Widmer and Oliver Groening of the nanotech@surfaces laboratory supervised Maeder's project, which addressed the question of whether the state density of valence electrons at a surface is correlated with its quasicrystalline topography. The analysis method used by the young scientist was Low-Temperature Scanning Tunnel Microscopy and Scanning Tunnel Spectroscopy (STM/STS), which can be used to investigate surfaces with a resolution on the atomic scale. Applying this technique allowed Maeder to demonstrate beyond any doubt the correlation between local state density and the aperiodic topography of the surface. In contrast to earlier photoemission-based experiments on the microscopic scale, the local shape of the state density on the nanometer scale was found to be "spiky". However, when the STS measurements were averaged over a larger area (10x10 nm²) the result was a smooth state density analogous to the photoemission data results. Maeder's work is a perfect example showing that physics on the nanometer scale governs phenomena in our macroscopic world. It also shows what a central role the STM/STS technique will play in future projects investigating the electronic structure of quasicrystals. With this work Ruben Maeder has successfully completed his Master's degree in Physical Chemistry at the University of Bern.

Enrico Koerner completed his Master's thesis work at the Empa St. Gall, in the Plasma Technology Group (headed by Dirk Hegemann) of the Functional Fibers and Textiles laboratory. Under the supervision of Michael Keller, Koerner's project is entitled "Coating synthetic fibers from the gas phase by means of Radiofrequency Plasmas (RF) with hexamethyldisiloxane (HMDSO) and characterizing the resulting fiber properties". Synthetic fibers are given functional properties by plasma-coating them with a quartz-like surface layer using the CVD gas phase continuous fiber coating plant constructed at the St. Gall site. At normal temperatures and pressures HMDSO is a liquid, and it must be made gaseous to be used for the environmentally friendly, dry plasma process. This method of lending fibers functionality on a continuous

basis is a world-wide first, and by coating with HMDSO the fibers can be given different, contrasting properties. By adding oxygen during the process, the surface coating becomes hydrophilic (wetable), otherwise it remains hydrophobic (water repellent). The nanometer-thin coating is also scratch-resistant and semitransparent. The resulting functional fibers find applications as technical textiles, in particular for medical purposes, and as functional materials (for example high-comfort sportswear). With this work Enrico Koerner has successfully completed his Master's degree in Mechanical Engineering (specializing in textile technology) at Dresden University.

The young researchers have decided to remain true to Empa – both Ruben Maeder and Enrico Koerner have decided to continue their research activities through PhD projects.

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Empa CEO Prof. Louis Schlapbach, with the two Empa Research Award winners (l. to r) Ruben Maeder and Enrico Koerner