BOTTOM-UP APPROACH BASED ON S-LAYERS AS TEMPLATES IN THE FORMATION OF ORDERED ARRAYS OF METALLIC NANOPARTICLES

Christina Altmutter[1], *Dietmar Pum*[1], *Rajesh R. Naik*[2], *Uwe B. Sleytr*[1], *Margit Sára*[1]

[1] *Center for NanoBiotechnology, University of Natural Resources & Applied Life Sciences, Gregor-Mendel-Strasse 33, 1180 Vienna, Austria*

[2] *Air Force Research Laboratory, Materials and Manufacturing Directorate, 3005 Hobson Way, Wright-Patterson Air Force Base, Ohio 45433-7702, USA*

christina.altmutter@boku.ac.at

Crystalline bacterial cell surface layer (S-layer) proteins have the intrinsic tendency to self-assemble into two-dimensional arrays in suspension and at various interfaces. S-layer lattices exhibit either oblique, square or hexagonal lattice symmetry with unit cell dimensions in the range of 3.5 to 35 nm. S-layers are generally 5 to 10 nm thick. In addition to the unique properties of native S-layer proteins as well defined binding matrices, genetically engineered S-layer fusion proteins opened a new horizon for the tuning of their structural and functional features.

Metal binding or precipitating peptides as functional domains were fused to S-layer proteins. In detail, a silver or cobalt binding sequence was fused to a C-terminally truncated form of the S-layer protein SbpA of *Bacillus sphaericus* CCM 2177. Amino acid position 1068 is known to be located on the outer surface of the S-layer lattice and therefore the fused functional domains are accessible to metal binding after oriented recrystallization of the S-layer fusion proteins.

Such S-layer fusion proteins can be expected to recrystallize on technologically important substrates (e.g., silicon wafers, gold chips) and shall be exploited as patterning element for the bottom-up fabrication of regularly arranged nanoparticles or carbon nanotubes.

References:

[1] Rajesh R. Naik, Sharon E. Jones, Christopher J. Murray, Hoseph C. Mc Auliffe, Richard A. Vaia and Morley O. Stone 2004. Peptide templates for nanoparticle synthesis derived from PCR-driven phage display. Adv. Funct. Mater. 14:1-7

[2] Margit Sára, Dietmar Pum, Bernhard Schuster and Uwe. B. Sleytr 2005. S-Layers as Patterning Elements for Application in Nanobiotechnology. J. Nanosci. Nanotechnol. (in press)