

Bio-sensing of arsenic by S-layer-modified gold nanoparticles

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In recent years, there is an increasing interest in the development of rapid, inexpensive and customer-friendly bio-sensing devices for fast detection of critical substances even under field-conditions. Since the first investigations by Mirkin and co-workers [1], several colorimetric-based systems with gold nanoparticles have been developed. The basic principle of detection utilised the strong dependence of the optical properties of the nanoparticle on their size. Thus, gold nanoparticles are coupled with molecules that target analyte of interest. Upon binding of analytes to corresponding target molecules on the surface of gold nanoparticles, a particle aggregation occurs, which lead to a colour shift from red to purple. In view of this, we investigated, for the first time, the use of bacterial surface layer proteins (S-layers) as target molecules for detection of arsenic in model solutions. The aim of our work was to investigate the capability of several S-layers on gold nanoparticles to detect arsenic (V). S-layers are multifunctional molecules with a remarkable potential for bio- and nanotechnological applications [2]. Using the S-layer of *Lysinibacillus sphaericus* JG-A12, concentrations of arsenic in the range of 1 mM to 50 μ M were detectable. Further, the sensitivity of the system was tunable by changing the nanoparticle size.

Acknowledgment

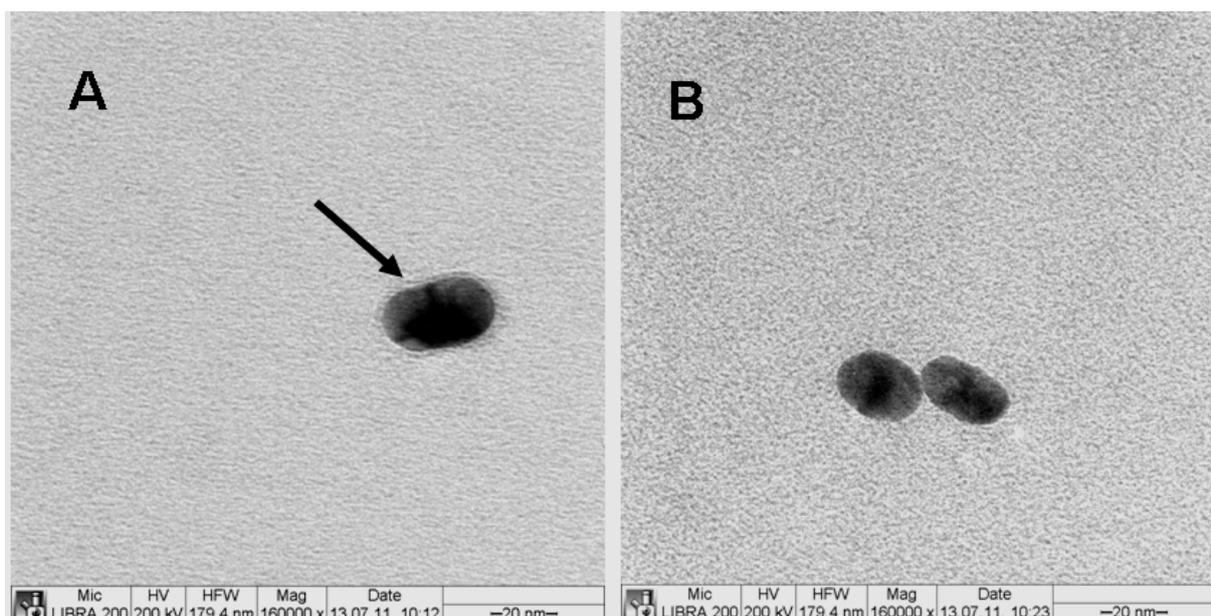
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References

[1] Mirkin, C.A., Letsinger, R.L., Mucic, R.C., Storhoff, J.J., *Nature*, **382** (1996) 607

[2] Sleytr, U.B., Huber, C., Ilk, N., Pum, D., Schuster, B., Egelseer, E.M., *FEMS Microbiol. Lett.*, **267** (2007) 131

Figures



- A) TEM image of an S-layer coated gold nanoparticles at p H 3.5.
- B) TEM image of uncoated gold nanoparticles at pH 6.