In recent years great attention has been paid to microbial technologies of nanoparticle production. It is important to examine a new class of microorganisms and different experimental conditions for synthesis of nanoparticles using a new high-resolution electron microscopy technique for visualization and examination of the produced nanoparticles. Novel strains of actinomycetes Streptomyces glaucus 71MD, Streptomyces sp. 211A, Arthrobacter globiformis 151B, Arthrobacter oxydans 61B and blue-green microalga Spirulina platensis were used for synthesis of silver and gold nanoparticles.

The studies were carried out using different techniques including scanning electron microscopy (SEM) and energy dispersive X-ray analysis. Microstructural images of the samples were taken on dual beam FIB/SEM FEI Quanta 3D FEG with LowVac and ESEM options. Microbial samples were studied without conductive coating in low vacuum and ESEM modes. It was demonstrated that the gold and silver granulates explicitly indicate the presence of conglomerates ~ 1 µm in size composed of much smaller particles.

Qualitative and quantitative elemental analysis was carried out by XEDS SEM electron microprobe. XEDS results confirmed the presence of gold and silver in analyzed microbial samples.


Fig. 1: SEM micrograph of Spirulina Platenis cells imaged in low-vacuum mode.

Fig. 2: SEM micrograph of Streptomyces sp. 211A cells imaged in native state (ESEM mode).

Fig. 3: EDS spectrum recorded from Spirulina Platensis after formation of gold nanoparticles.