

The study of silver nanoparticles by means of SEM, EDX, STM

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Silver nanoparticles have been the subject of extensive study in many research groups for the past several years because of their potential application in electronics, chemistry and medicine. In our research we studied properties of commercially available nanosilver. Particles [1] produced by thermal decomposition of the silver salts of fatty acids [2]. The experiment was carried out by the use of scanning electron microscope (SEM), energy dispersive X-ray analysis (EDX), and scanning tunneling microscope (STM). At the beginning we decided to use SEM and EDX to study silver powder (Fig. 1). Our results showed conglomerates of particles which size was estimated at 5 μm . EDX analysis suggests that conglomerates observed by the use of SEM contain notable quantities of silver. Afterwards, we started investigations of silver powder by the use of STM. Unfortunately, additional preparation of powder was necessary to perform such investigations. A small amount of colloidal silver particles was dissolved in hexane. Then, a droplet of the solution was deposited on Au(111) and dried in the air for 3h. Contrary to previously reported techniques of nanosilver preparations in which tiols were used to stabilize nanosilver on gold substrate [3] we decided to use not modified nanosilver due to its possible technological applications [4]. Results of our STM investigations (Fig. 2) suggest that separate nanoparticles could be found. What is more, a rough estimation of nanoparticles diameters was given, and it equals a few nm.

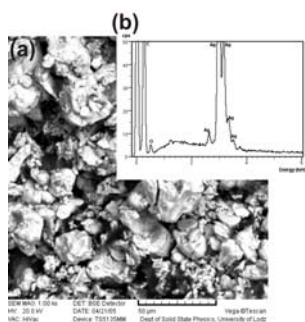


Fig. 1. (a) $200 \times 200 \mu\text{m}^2$ SEM image showing conglomerates of silver nanoparticles; (b) EDX spectrum recorded on silver powder (a).

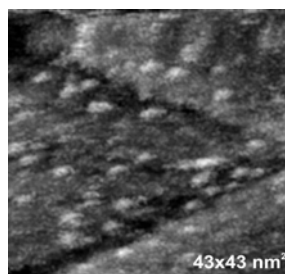


Fig. 2. $43 \times 43 \text{ nm}^2$ STM topographic image of nanoparticles deposited on Au(111) substrate.

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- [2] H. Nagasawa, M. Maruyama, T. Komatsu, S. Isoda, T. Kobayashi, *phys. stat. sol. (a)* **191** (2002) 67.
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