

## AFM investigation of irradiated rock salt crystals in high vacuum and in air.

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At first AFM investigations of irradiated NaCl crystals were carried out in air in tapping mode with the microscope P47-SPM-MDT (Russia, NT-MDT) and Si cantilevers NSC11 (Estonia, Mikromasch). Concentration of metallic Na in investigated sample was about 0,6 %. By data of the experiment it was found aggregates of particles. AFM images of them are presented in fig. 1a. The calculation of density of particles in AFM images showed that it was more than 0,6 %. We have conclude that such result was obtained on account of metallic Na reaction with air. In order to exclude influence of air ulterior AFM investigations have been carried out in high vacuum. These investigations were carried out with atomic force microscope Omicron (Omicron, Germany) in tapping mode. Si cantilevers NSC11 (Estonia, Mikromasch) were used. The results show that metallic sodium precipitates are present on the surfaces of freshly cleaved samples. Until now we have investigated three natural rock salt samples with different concentrations of metallic Na: sample 1 with 0.66%, sample 2 with 1.52% and sample 3 with 1.92% metallic Na. The three samples have revealed quite different structures for the Na precipitation. While sample 1 showed a majority of isolated and more or less spherical nanoparticles (fig. 1b), the situation in sample 2 was much more complex. Most of the nanoparticles in sample 2 cannot be considered as isolated particles, because they form more or less fractally shaped networks (fig. 1c). The individual nanoparticles in the structures can be recognized and it can be seen, that the particles form highly random networks. The most intriguing results were obtained for sample 3, which revealed that the nanoparticles almost form a fabric of bundles of linear arrays, in which the individual nanoparticles can still be recognized (fig. 1d). In some of the pictures taken from sample 2 we can see the onset of the formation of these linear arrays of nanoparticles. It appears that in heavily irradiated rock salt a new “polymeric” state of Na is developed, which has very interesting electronic, optical, magnetic, conductivity properties. The implications of the above-described structures will be discussed. Work was executed under support grant NWO № 047-008-021 «Preparation and Studies of New Quasi-One-Dimensional Materials».

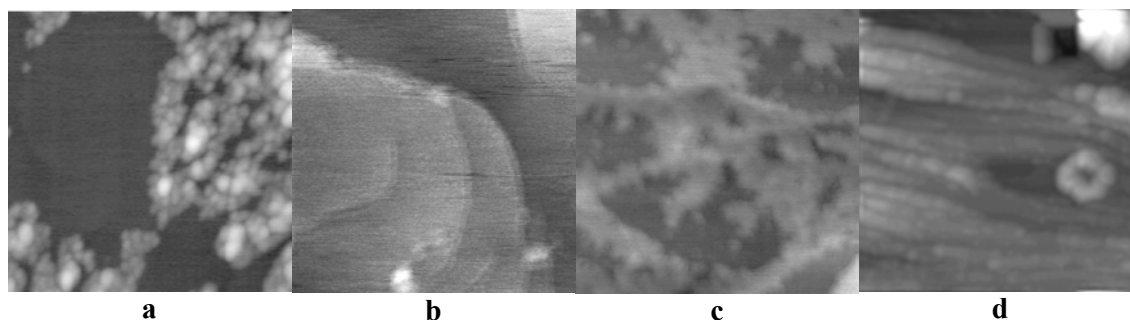


Fig. 1. AFM images of irradiated natural rock salt sample. Concentration of metallic Na is: a – 0,6 %; b – 0,66 %; c – 1,52 %; d – 1,92 %. Size of images is: a - 650×650 nm. b - 750×750 nm. c - 800×800 nm. d - 400×400 nm.