THE EFFECT OF EXTRACTION PROCEDURE ON THE SURFACE CHEMISTRY OF SYNTHETIC NANODIAMONDS. A. P. Koscheev[1], A. E. Serzhantov[1], S. Merchel[2*], U. Ott[2], O. Guillois[3], and C. Reynaud[3], [1]Karpov Institute of Physical Chemistry, Vorontsovo Pole 10, 105064, Moscow, Russia, (koscheev@cc.nifhi.ac.ru), [2]Max-Planck-Institut für Chemie, Becherweg 27, D-55128 Mainz, Germany, [3]Service des Photons, Atomes et Molécules, CEA-Saclay, 91191 Gif/Yvette Cedex, France.* present address: BAM, D-12205, Berlin, Germany.

Introduction: The surface species on presolar nanodiamonds, extracted from meteorites, may carry a signature of chemical processes in the interstellar medium. However, the chemical extraction procedures were shown to modify many of the surface IR-active chemical features [1-3]. To understand if there is a relation between the chemical properties of starting and extracted diamond grains we have studied the effect of the same extraction procedure on the surface chemistry of synthetic analogs of meteoritic nanodiamonds.

Experimental: Four samples of ultradispersed detonation diamonds (UDD) with different surface chemistry were used as starting material [4]. All samples were treated by the same chemical procedure used to separate meteoritic diamonds including treatment by concentrated mineral-acids, oxidation in $HClO_4$, and washing in HCl. The surface chemistry of the samples both before and after chemical treatment was studied by means of thermodesorption mass spectrometry (TDMS) and IR spectroscopy [4].

Results and Discussion: TDMS study of as received samples showed release of H_2O (100-600 ^oC), CO_2 (200-600 ^oC), CO (400-1000 ^oC), and H_2 (above 800 ^oC) as main components. Different samples differed mainly in the temperature profiles of CO and CO_2 release caused by decomposition of oxygen-containing surface groups. The main difference observed in IR spectra of various samples was the shape of 1800-1700 cm^{-1} band related to the configuration of surface C=O bonds.

TDMS and IR data on treated samples indicated substantial chemical modification of the surface, but there was a clear «memory» of the initial surface properties. For all samples studied the final state of surface oxidation depends on the initial one. Applying the constructed "calibration" curve "starting vs. final states" to the data on diamonds extracted by the same procedure from the different meteorites [3] we find that Allende and Murchison diamonds should have had different levels of initial oxidation as characterized by the IR bands at 1720 and 1740 cm^{-1}, respectively.

Another observation made by TDMS of treated samples concerns the presence of chlorine caused by chemical treatment and desorbed from the surface as HCl near 700 ^oC. The abundance of this specie in different UDD varied two orders of magnitude. If this is also true in the case of meteoritic diamonds, it might open a way to separate the different types of meteoritic diamonds according to their surface properties using an appropriate titration technique.

In conclusion, our results indicate that the effect of extraction procedure on the surface chemistry of UDD strongly depends on the starting properties of nanodiamond grains. We are under way to apply this approach to meteoritic diamonds.

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