ATOMIC FORCE AND SCANNING ELECTRON MICROSCOPE INVESTIGATIONS OF NANOCOMPOSITE ANALOGUES OF INTERSTELLAR AMORPHOUS SILICATES. I. Weber[1], J. Romstedt[2], Z. Al-Badri[3], D.G. Grier[4], and E.K. Jessberger[1], [1]Institut für Planetologie/ICEM, Wilhelm-Klemm-Str. 10, 48149 Münster, Germany, sonderm@uni-muenster.de. [2]ESA/ESTEC, Space Science Department, Keplerlaan 1, Postbus 299, 2200 AG Noordwijk, The Netherlands. [3]PO Box 5516, Department of Chemistry, North Dakota State University, Fargo ND 58105-5516. [4]Department of Physics, James Franck Institute and Institute for Biophysical Dynamics, The University of Chicago, Chicago, Illinois 60637.

The scanning probe microscopy (SPM) consists of a family of microscopy methods where a very sharp needle (hereafter called tip) is scanned across a specified surface. With this method it is possible to measure and monitor the interactive forces between the tip and the sample surface. One primary form of SPM is the atomic force microscope (AFM) [1]. The material of the sample as well as the matter of the tip are responsible for the distinct forces, which can be determined in different sub-modes. One further development of the AFM is the magnetic force microscope (MFM). Among this technique it is achievable to analyse the topography and the magnetic features of the sample surface at the same time [2].

In our study we generate a database for the MIDAS experiment on the Rosetta mission, which will start in near future to investigate the environmental dust of a comet [3]. Complementary to the MIDAS experiment we use a conventional AFM for our analyses. The total number of AFM tips that are on-board the MIDAS experiment is 16, including four magnetic tips. In order to interpret the upcoming AFM and MFM images from MIDAS we assemble mineralogical data of cometary analogue material made with different methods.

One possible analogue material is a designer polysiloxane with variable kinds of substituents, in our case metallocenes [4]. Thermal treatment at 500°C of this material led to an assemblage of silicon oxide matrix with nanophase Fe-metal in it. TEM investigations shows a nearly homogeneous distribution of smaller than 100 nm Fe-metal spherules in the silica matrix. Infrared spectra of dust in interstellar molecular cloud environments have almost the same feature like those obtained by Fourier transform infrared spectroscopic measurements of this material in the laboratory [5].

In this work we analyse this analogue material with an AFM. In particular we want to investigate the Fe-metal spherules with the MFM technique. MFM investigations of CV chondrite Vigarano showed that different magnetic signals from different Fe-containing materials can be obtained [6]. These authors demonstrated that it is possible to indeed get a weak signal from an Fe-metal phase. Further element mapping with a scanning electron microscope from the same area should prove the occurrence of Fe-metal.

Acknowledgement: This work was supported by the *Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR).*

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