COLLECTING BACTERIA TOGETHER WITH AEROSOLS IN THE MARTIAN ATMOSPHERE BY THE FOELDIX EXPERIMENTAL INSTRUMENT DEVELOPED WITH A NUTRIENT DETECTOR PATTERN: MODEL MEASUREMENTS OF EFFECTIVITY. ***T. Földi*[1], *Sz. Bérczi*[2],** [1]FOELDIX-LÁGYMÁNYOS Ltd., H-1117 Budapest, Irinyi József u. 36/b. Hungary, [2]Eötvös University, Department of G. Physics, Cosmic Materials Space Research Group. H-1117 Budapest, Pázmány Péter sétány 1/a, Hungary, (bercziszani@ludens.elte.hu)

Introduction

Collecting Martian bacteria from the atmosphere is a capable technology by FOELDIX-1 instrument on Hunveyor. This style of bacteria collecting method is based on the electrostatic coagulation properties of both the dust above planetary surfaces [1-5] and the FOELDIX-1 instrument. We developed a detector unit to FOELDIX-1 in order to observe the main characteristics of the bacteria collected. It consists of nutrient containers forming a pattern on the detector wall.

We plan to carry out 3 phases of the research. First is the production of the instrument. This is phase is ready. The second is the model experiment phase with two stages. Stage a) **labor experiments in order to measure the effectivity of FOELDIX-1; - this is also carried out**; stage b) experiemnt on Hunveyor in terrain conditions - this is in process. The third phase is the use of the instrument in a Martian space probe. This phase is a farther future.

The dust thrown out from dusty regions by dust devils on Mars are always levitating above the surface of Mars. [6-8]. Space probe in low altitutde orbit can carry out coagulation of electrostatically charged dust particles, rare H_2O molecules and the suggested bacteria from the dusty Martian atmosphere. This atmospheric gas is transported by the FOELDIX experimental assemblage through the instrument's space where electrodes and allows to precipitate in the vicinity of some specially charged electrodes [9]. We think that a desert warnish, or CBC type consortia of bacteria exist in Mars and they will be attached to the coagulated soil particles. This way they can serve as aerosol sources.

Extra components of the planetary dust clouds

Leevitating charged dust particles are known since they had been measured on Surveyors [1], Apollo's LEAM [2]. Their models [3-5] are also good models for FOELDIX-1, which was constructed on the basis of coagulation mechanism probably working in the lunar quasiatmosphere, although with ordered electrodes [6,8], contrary to the random ones in the lunar quasiatmosphere.

Windstorms on Mars are known and photographed since old times. There the planetary boundary layer plays important role in lifting up the dust particles and other aerosols to higher altitudes, too. Because of observations of recent water in the surface upper layers by Odyssey, and also the reports of dark dune material phenomena with seasonal spotting in the defrosting period [11] we think that living constitutents of the Martian soil may be dragged to the atmospheric dusty heights and and orbiter supported with a FOELDIX can collect them in the following technology.

Coagulation of dust+water+bacteria along alternating electrodes

Water molecules help coagulation because they are are small negative ions and have far longer lifetime then that of the small positive ions [6,8, 11, 12] In the rare gas above dusty planetary surface the rare water molecules act with their negative charge and they frequently collide with particles of a positively charged dust cloud particles. In these collisions complex coagulated particles are produced forming loose aggregate of ions, water and other aerosols attached. The larger the coagulated unit, the greater is its mass and the lower is its velocity compared to the small mass particles. (While colliding with a negatively charged water molecule water will attach to the larger one.)

The style of observation is Pathfinder's magnetic pattern experiment like

The coagulated dust particles fly through FOELDIX-1 instrument. The special detector unit consists of electrodes to descent particles and spots with a nutrient soil attached. Nutrient spots form a pattern. They are placed on the wall of the dust collector. In principle this detector unit is - in many respects - similar to the Magnetic Properties Experiment of the Mars Pathfinder, where a curtain of magnetic materials were fixed on a surface in a pattern of spots. Magnetic forces glued the magnetized particles on the spots. The repeated dust interaction with this curtain amplified the pattern of the colored dust particles attracted on the spots till the visibility of the pattern. Even by camera observation of the magnetic spot pattern - with various megnetisation strength of the spots in the curtain magnets - allowed estimation of the magnetisation of the dust particles flown by winds and attracted by the magnets [10].

In our measuring detector various nutrients are fixed in the vicinity of special electrodes. These

electrodes allow the coagulated dust and bacteria grains (complex particles) to precipitate from the streaming particles in the instrument. The coagulated materials with various bacterial components can grow on the nutrient spots with different effectivity. Repeated interaction of the precipitated dust-and-bacteria coagulates will change the color and extent of the nutrient spot regions and amplifies the pattern of the nutrients till the visibility of the arrangement of spots. Camera observation of the detector's spot pattern will show the types of bacteria existing inside the coagulated dust particles.

FOELDIX-1 effectivity labor measurements

There were two isolated rooms. There was a window between the two chambers and in this window was placed FOELDIX-1. with airflow insulation. This airflow insulation was necessary in order to exclude the air transport transport outside of the instrument. In the chamber-1 a standard bacteria aerosol injector was operated and this way this chamber was polluted by a given amount of bacteria. The polluted air could transport through the FOELDIX-1 placed in the window between the two chambers and polluted the chamber-2. The concentration of the pollution was measured in the two chambers by nutrients placed in hundreds of Petrie dishes. We used differential diagnostics in the measurement which meaned the produced numbers of bacteria cultures in chamber-1 and chamber-2.

During the measurement it was waited that FOELDIX-1 transports all the polluted air from chamber-1 to chamber-2. This covered some hours. The experiment was repeated with various bacteria. The effectivity of the bacteria filtering of FOELDIX-1 was better then 0.99. In the Hunveyor free space experiment planned the filtering and measuring is in the same volume.

Summary

The new FOELDIX instrument with the bacteria detector unit is capable to observe various bacteria units coagulated by the instrument and deposited by special electrodes on nutrient spots of the detector. Such detector can measure not only bacteria but the soil type which is glued with the bacteria. Therefore it is probable that components of the cryptobiotical crust units may be discovered by this measuring technology. A measurement showed that FOELDIX-1 has a very good effectivity in collecting living bacterial aerosols and water which is also present in the vicinity of the Martian surface [14,15].

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