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SOIL PREPARATION SYSTEM AND MULTI-FUNCTIONAL DRILL FOR FUTURE SUBSOIL SAMPLING ACTIVITIES ON PLANET MARS

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The search of signs of past life on the red planet continues to be the focus for several major future missions where analyses of the Martian surface and subsurface soil composition could provide further insights towards the search and the better understanding of Mars' morphology. Efficient and reliable tools are necessary to support these exploration activities and sophisticated experiments to be carried out effectively. The payload constraints demand microscopic yet multi-functional tool sets to adapt to a wide range of tasks.

A team from Hong Kong has been appointed by the United Kingdom to design and manufacture the sampling tools on board of the Beagle 2 Lander. Based on past experience, the team has designed small and lightweight soil preparation system (weighing only 230g and grinding to size of 1mm) for the Russian Phobos-Grunt Mission planned to be launched in 2009. The device is developed to function under an environment of practically no gravity. These recent developments can be adapted for future applications on Mars.

An overview on different sampling methods and sample preparation techniques will be presented here based on experiences acquired during past missions to our solar system's planets. Using the ExoMars vehicle as a baseline, an advanced sampling concept of integrated downhole hammering sampler will be presented. The proposed sampler is designed for fine sand sampling, as well as for rock coring and gripping. Implemented onto a long drill, this system is able to function several feet below the Martian surface. The correlation between the scientific objectives of future Mars missions to the design of the proposed novel sampling strategy will be illustrated. The paper will conclude with an outline of the prototyping efforts and the other future development of the tool.

References: .

Figure 1. Drill End of Proposed Integrated Sampler