SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 3 (2C)

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DEVELOPMENT OF AUTOMATIC LUNAR SOIL SAMPLING DRILLER

Abstract

According to the lunar engineering project demand, that the sampler drills not less than 2m in depth and takes more than 400g sampled soil of mass, a complete set of technical solution of unmanned autonomous soil sampling driller is put forward. Based on the special environment of the moon and the properties of the lunar soil, the characteristics and problems of the drilling system are considered. Meanwhile, the function and component of the sampler are discussed. The principle of operation is also described. And the workflow of automatic sampling is constituted. Furthermore, the high reliable coring mechanism is innovated. The principle prototype is introduced. And the experimental lunar soil is prepared. For the soil, basalt is used as the basis. Therefore, its physical properties, such as granularity, grain composition, granule shape and relative density, are similar to the actual lunar soil. Afterwards, the soil is put to the drilling tests in the laboratory with the principle prototype. The experiments succeed in the following critical technologies: non-slip filled type soft coring, rotary drilling with impact, winding and shaping of the sample. The results indicate that the coring mechanism is reliable. The sampled lunar soil is easy to be shaped and retrieved with original stratification. In conclusion, the researches provide important reference values to the sampling technology of lunar exploration.