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ABSTRACT

Concept for Lightweight Spaced-Based Deposition Technology

In the quest to accomplish the ambitious goal set out in NASA's Lunar-Mars proposal (January 14, 2004), advanced thin-film deposition technology will be required. The ability to deposit high performance thin-film coatings in the vacuum of lunar-space will be extremely valuable for executing this new space mission. Developing lightweight space-based deposition technology (goal: < 300g, including power supply) will enable the future development of flexible large-area space antennae and fixed telescope mirrors for lunar-station observatories. Deployable solar-propulsion concentrator arrays, coated in space, will accelerate the feasibility of human flights to Mars. Space-based solar energy production, using large area focusing adaptive optical mirrors, will beam energy back to earth relieving the growing demand for terrestrial energy. Filtered Cathodic Arc (FCA) is a proven terrestrial energetic thin-film deposition technology producing high performance metal, diamond-like-carbon (DLC), and dielectric material coatings suitable for space applications. Miniaturized FCA has already been considered for space propulsion. Advances in developing lightweight FCA technology for spaced-based deposition will enable the design of a feasible robust system that can be robotically operated for depositing uniform thin films on large area deployed flexible substrates. Metals, especially gold and silver, will play a significant role in the development of advanced large area space deployable optical mirrors.