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BIOREFINERY CONCEPT FOR LONG TERM SPACE MISSION

Abstract

In recent years, interest in long term missions has increased significantly. This poses a huge challenge to modern engineering. It is necessary to develop useful and also reliable technologies. A good introduction to the discussion on long-term space missions is a contest, organized by The Mars Society. The competition involves designing a Martian colony, capable of keeping 1,000 people alive. Such base should be characterized by high self-sufficiency. One of the basic challenges for such colony, was to design a biomass circulation system, consisting mainly of inedible parts of plants. Due to the relatively large amount of habitat residents, this material poses a large percentage of waste generated by colonies plant crops. Such biomass is rich in nutrients such as vitamins, proteins, and biopolymers: lignins, cellulose and hemicellulose. The article includes a concept of biorefinery, for the needs of the Martian colony, for The Mars Society competition. The installations consist of universal devices, easily adjustable to current needs. All the technological processes are so selected, whether for substrates or catalysts, they were easily available on Mars. Biorefinery allows to separate and purify valuable ingredients like micronutrients or proteins to use them as supplements for the astronauts diet. Thanks to the presence of sugar polymers, it is possible to produce fuel in the form of ethanol, but also everyday clothing, plastics such as nylon or polyamide, to name a few. The biorefinery concept fits perfectly into the sustainable development strategy.