

IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)
Life Support, habitats and EVA Systems (7)

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MODULES-PBR AS FIRST ELEMENT OF A BIOREGENERATIVE LIFE SUPPORT SYSTEM

Abstract

For an entire bioregenerative life support system design it is mandatory to understand the behavior of each module under variable and complex environmental conditions. The biochemical and physicochemical in- and outputs of each module needs to be investigated and optimized in a modular approach - before combining several modules step by step to a more complex and bigger system (bottom up).. Within the scope of ModuLES (**Modular Life Support and Energy Systems**), initiated and funded by the German Space Agency, DLR, a photobioreactor (PBR)-system with the unicellular microalgae *Chlamydomonas reinhardtii* was selected as the starting point and starting module of this research. The design of the PBR and its subsystems was driven by the goal to understand the behavior and physiology of *Chlamydomonas* in a closed system - in regards to the production of oxygen under a given supply of carbon dioxide, nutrients and light energy. E.g. essential to enable long term runs of few weeks in this first closed turbidostatic running PBR system, a main PBR-subsystem is for example the MRU (media recycling unit) – to automatically reconstitute lowered nutrient concentrations, caused by continuous algae growth. Potential coexistence of the microalgae with e.g. bacteria beside other environmental systems is a further issue, to be solved towards BLSS. Goals of the actual project phase are i) the finalization of a middeck locker fitting design with ii) subsequent realization of a corresponding breadboard, followed by iii) successful biological test runs of several week in the breadboard, being all the precondition for the realization of the flight model in a next development phase. Some exemplary scientific and technical aspects will be highlighted at the assembly.