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MICROALGAE CULTIVATION IN SPACE FOR FUTURE EXPLORATION MISSIONS: RESULTS OF
THE PREPARATORY ACTIVITIES FOR A SPACEFLIGHT EXPERIMENT ON THE
INTERNATIONAL SPACE STATION ISS**Abstract**

Microalgae cultivation in space enables an essential step to close the carbon loop in life support systems (LSS), which is important for future and far-distant exploration missions. Utilization of photosynthesis and the combination with existent physico-chemical technologies offer a wide potential of benefit for LSS. *Chlorella vulgaris* as a promising species allows for cultivation in pumped loops to produce oxygen and edible biomass from carbon dioxide and water. Further nutrients such as ammonium and phosphate are needed. Technological demonstration of the ability to control microalgae cultivation under space conditions is the main focus of the prepared experiment PBR@LSR (Photobioreactor at the Life Support Rack) on the International Space Station. The cultivation in a 650 mL loop shall last half a year, and the carbon dioxide for the algae is extracted from cabin air by the carbon dioxide concentration unit of the LSR. The paper sums up ground test results on components selection (particularly the carbon dioxide supply unit, the cultivation chamber design, membrane selection for carbon dioxide and oxygen transfer, illumination by adapted LED panels, sensors for carbon dioxide, oxygen, pH value, temperature, humidity and pressure measurement, oxygen absorber), settings of cultivation parameters, operational techniques (inoculation, feeding and harvesting, termination and storage) and the development of tools for the astronaut. Besides station accommodation and safety requirements these results are shaping the (preliminary) design. The paper concludes with an outlook of the next steps in view of flight model preparation.