

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

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University, Russian FederationFULL INCLUSION FEASIBILITY OF HUMAN METABOLITES' PRODUCTS INTO BTLSS MATTER
TURNOVER**Abstract**

The report presented dwells upon the ways of closure increasing of biological-technical life support systems (BTLSS) for space applications. In this connection, a perspective method of organic wastes' treatment developed at IBP SB RAS on the technology base of 'wet incineration' in hydrogen peroxide to obtain fertilizers for higher plants is under study. The method was relatively compact, energy efficient, productive and ecologically clean. However, about 4-6 g/l of hardly dissoluble sediment precipitated after the initial process, containing such essential nutritive elements as Ca, Mg, P, Fe, Cu, Mn, and Zn were generated. They were found to be unavailable for plants grown on hydroponics thus falling out of turnover as deadlock products. Possible methods of that sediment dissolving were researched. In particular, the sediment secondary incineration in $\text{HNO}_3 + \text{H}_2\text{O}_2$ appeared to be the most promising. Introduction of that new technological process, including only substances synthesized inside the BTLSS matter flows, allowed making more than 90% of each nutritive element considered available in irrigation solutions thus returning them into material turnover. Efficiency of irrigation solutions benefited with the elements of mineral nutrition after the sediment dissolution was shown. For that purpose, lettuce was grown as the test object on newly prepared irrigation solutions. Crop yield was shown to increase more than twice, as compared to the nutrient solutions prepared without the sediment transfer into a soluble state. Composition of attendant gases emitted in the process of that technology has been analyzed. Oxidation dynamics in the BTLSS soil-like substrate of small fractions of a wax-like sediment remaining after its dissolving has been studied. In conclusion, the entire technological chain aimed at inclusion of deadlock products of human metabolites "wet incineration' into the BTLSS turnover has been suggested and discussed.