

Study on trace contaminants control assembly for sealed environment chamber

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Abstract: The biological and Physicochemical (P/C) life support technologies are all important parts to establish a human Closed Ecological Life Support System (CELSS) for long-duration mission. The latter has the advantages of lower power consumption, lower mass and higher efficiency, therefore, researchers often incorporate the use of biological systems with P/C life support technologies to continuously recycle air, water, and part of the solid waste stream generated, such as the Russian BLSS and the NASA-sponsored Lunar-Mars Life Support Test Project (LMLSTP). In short, these tests were very successful in integrating biological and P/C life support technologies for long-duration life support. Therefore we should use a combination of integrated biological with P/C life support technologies in a human CELSS. Human, construction materials, plants, animals and soils release much trace toxic gases in a CELSS, and they will inhibit plant growth and badly affect human health when their concentrations rise over their threshold levels. The effect of biological trace contaminant control technologies is slower especially for a human sealed chamber because human produce much more methane and other contaminants. A regenerative Trace Contaminant Control Subsystem (TCCS) with P/C technology is a more important part in this case to control quickly the airborne contaminants levels and assure human in good condition in a sealed chamber. This paper describes a trace contaminant control test facility incorporated a 8 m³ sealed environment chamber, a regenerative TCCS with P/C technology, a measurement and control system, two in-line infrared ray gas analyzers (IRGA) and a GC/MS instrument. Prime objectives of the test facility are to study the airborne contaminants characters in a sealed chamber and provide design and control methods about the prototype device of TCCS. Some experimental researches were conducted on working performances of the test facility. The experimental results indicated the TCCS had higher control precision, better stabilization of working performance and higher purification efficiency. **Keywords:** Trace Contaminant Control; Sealed Environment Chamber; Air Quality; Experiment