54th IAA SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE MANAGEMENT IN SPACE ACTIVITIES (D5)
Quality and Safety, always a beginning! (1)

Author: Dr. Lana Moukhamedieva
SSC RF-Institute of Biomedical Problems RAS, Russian Federation

Dr. DMITRY OZEROV
IBMP, Russian Federation

THE DISTRIBUTION OF TRACE CONTAMINANTS IN THE MANNED SPACE STATION ATMOSPHERE

Abstract

The large number of air pollution sources onboard a space station determines multicomponent chemical composition of the atmosphere with the prevalence of xenobiotics. The International Space Station (ISS) atmosphere monitoring showed that the long-term use of the station leads to an expansion of the spectrum of volatile organic compounds and the main role in the level of pollution is assigned to polymers and delivered cargo. Long-term orbital and interplanetary space flights will require an automatic air quality control system for manned spacecrafts, forecasting levels of air pollution, operational assessment of toxic risks to human health, establishing of hygienic standards for various periods of averaging. Solution to the problem requires a systematic approach to the analysis of experimental data and the creation of probabilistic-statistical mathematical models which describe the distribution of trace contaminants in the manned space station atmosphere. The experimental data to determine the statistical model is based on the monitoring results of the air quality onboard the ISS from 2000 to 2020. In total, more than 30.000 measured concentrations of trace contaminants have been used in statistical analysis. The volatile organic compounds have been concentrated on sorbent tubes (AK-1M) which were used for air sampling on the ISS. The air samples delivered from the station have been analyzed by gas chromatography and gas chromatography-mass spectrometry. Statistical analysis of measured concentrations showed that the overwhelming majority (70The established model is consistent with the theoretical model adopted for general hygienic practice and allows the use of general hygienic approaches to predict the level of air pollution and assess the results of air quality monitoring onboard the long-term orbital and interplanetary stations.