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STUDY ON ON-ORBIT MICROORGANISM MONITORING TECHNOLOGY OF SPACE STATION

Abstract

China's Space Station will be built up from 2020 and completed in 2022 or latter. It composed of one core module and two experiment modules. Microbes are important risk that threatens the living environment in space station, they can adapt to the harsh environment in space and survive. Microorganism monitoring need to detect the total number of microorganisms in the space station environment and analyze the population distribution of microorganisms in the space station. However, due to the remarkable characteristics of extremely low concentration and diverse interference of the air microorganism in the closed environment on the space station, high sensitivity and high specificity detection at the same time is very challenging.

In recent years, new detection technologies have emerged to meet the actual needs of space station detection, but they have not been able to achieve accurate quantification of microbial species, or because the test took too long to provide timely feedback. This study takes the potential harmful microorganisms to the astronauts,instruments and equipment as the detection objects,and aim to provide automatic monitoring and identification of airborne microorganisms in the closed environment of the space station, and at the same time meet the needs of the technical requirements of space restriction, microgravity environment and rapid high sensitivity, high specificity and multi-target identification of the space station.

Two types of identification technology research were carried out in this study, immunological identification based on Upconversion characteristic spectrum and nucleic acid identification based on fluorescent probe characteristic spectrum. Technical index of the former method includes: detection speed within 15 minutes of each detection; detection sensitivity $<$ 1000cfu / ml; detection precision $<$ 15%. Technical index of latter technology includes detection speed within 1h of each detection; detection sensitivity $<$ 1000cfu / ml; detection precision $<$ 5%.

Keywords: China Space Station, Microorganism monitoring