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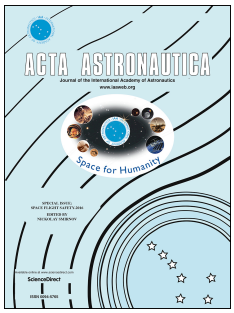


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# The Water Treatment and Recycling in 105-day Bioregenerative Life Support Experiment in the Lunar Palace 1

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**Abstract:**

In the bioregenerative life support system (BLSS), water recycling is one of the essential issues. The Lunar Palace 1, a ground-based bioregenerative life support system experimental facility, has been developed by our team and a 105-day closed bioregenerative life support experiment with multi-crew involved has been accomplished within this large-scale facility. During the 105-day experiment, activated carbon-absorption/ultra-filtration, membrane-biological activated carbon reactor and reduced pressure distillation technology have been used to purify the condensate water, sanitary & kitchen wastewater and urine, respectively. The results demonstrated that the combination of those technologies can achieve 100% regeneration of the water inside the Lunar Palace 1. The purified condensate water (the clean water) could meet the standards for drinking water quality in China (GB5749-2006). The treatment capacity of the membrane-biological activated carbon reactor for sanitary & kitchen wastewater could reach 150 kg/d. During the 105-d experiment, the average volume loading of the bioreactor was 0.441 kgCOD/($m^3$d), and the average COD removal efficiency was about 85.3%. The quality of the purified sanitary & kitchen wastewater (the greywater) could meet the standards for irrigation water quality (GB 5084-2005). In addition, during the 105-day experiment, the total

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