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COMPLIMENTARY SET-UPS FOR TOTAL CATALYTIC OXIDATION OF VOLATILE ORGANIC COMPOUND BY O3 AT LOW TEMPERATURES IN THE LOW EARTH ORBIT DESTINATION, SPACECRAFT AND IN FUTURE ENCLOSED ENVIRONMENTS

Abstract

Abstract In the future enclosed environments like ISS and spacecrafts, outside air is not directly fed to astronauts, because it contains high ozone concentration at elevated altitudes. In the habitat, inside air contains volatile organic compound, related to treatment products and the food provided to astronauts and space travelers. These products are dangerous in high concentrations, they can reduce oxygen concentration and cause respiratory problems. In this case catalytic converters are necessary to lower the concentration of ozone to the authorized values at the entry of ISS and spacecrafts, at ambient temperature and atmospheric pressure, also to treat the air of closed habitat to eliminate the VOCs such on-board equipment already exists but have to evolve to be adapted to the future space technologies and will require to work at much lower temperatures. Elimination of volatile organic compounds (VOCs) contaminants of indoor air needs the use of new technologies with a low energy cost since VOCs concentrations are low and the air flow to be treated is high. Conventional catalytic oxidation needs a high temperature (¿ 150C), which results in high energy consumption. To overcome this problem, we can use oxidizing species capable of carrying out total oxidation reactions at ambient temperature and low pressure. Amongst the various possibilities we have chosen to use ozone as oxidative species [1-4]. Manganese oxide-based catalysts are well-known to be effective for the oxidation of organic compounds by ozone. In order to optimize the role of the catalyst and the gas-solid contact, several catalytic configurations (manganese oxid variously doped by palladium) have been used to both evaluate catalyst in the elimination of VOCs and in the decomposition of residual O3 and reactor efficiencies. In the present work the catalytic oxidation of volatile organic compound is evaluated in a small packed-bed reactor, at high ozone concentrations (10-13 ppm) at room temperature and at very low pressure on our Pd-Mn /TiO2 catalyst has shown that such system can be used as efficient indoor air treatment.

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