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ABSTRACT

Paradoxically, trace contaminant control systems that suffer unexpected upsets and malfunctions can release hazardous gaseous contaminants into a spacecraft cabin atmosphere causing potentially serious toxicological problems. Trace contaminant control systems designed for spaceflight typically employ a combination of adsorption beds and catalytic oxidation reactors to remove organic and inorganic trace contaminants from the cabin atmosphere. Interestingly, the same design features and attributes which make these systems so effective for purifying a spacecraft's atmosphere can also make them susceptible to system upsets. Cabin conditions can be contributing causes of phenomena such as adsorbent "rollover" and catalyst poisoning can alter a systems performance and in some instances release contamination into the cabin. Evidence of these phenomena has been observed both in flight and during ground-based tests. The following discussion describes specific instances of system upsets found in trace contaminant control systems, groups these specific upsets into general hazard classifications, and recommends ways to minimize these hazards.