



Investigating a Rough-Vacuum, GN2 Purged Bakeout Method to Achieve High-Vacuum Outgassing Rates

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1. Abstract

ASTM E2900 requires high-vacuum conditions during bakeout to effectively remove volatile contaminants, but exposing high-vacuum chambers to high outgassing materials can introduce contamination risks rendering the chamber unusable for contamination sensitive hardware and lead to costly recovery efforts. This study evaluates whether a rough-vacuum, GN₂ purged bakeout chamber can achieve comparable outgassing performance while reducing these risks.

From a selection of commonly used spaceflight materials, baseline samples were baked out via ASTM E2900 Method B and then monitored by TQCM for 24 hours. Identical samples underwent a rough-vacuum, GN₂ purged bakeout before being transferred to a high-vacuum chamber for 5-hour TQCM measurements. Outgassing rates from both methods were compared to assess viability.

Results show that although the rough-vacuum, GN₂ purged process requires longer bakeout durations, it produces outgassing rates comparable to standard high-vacuum bakeouts, indicating it is a credible lower-risk alternative for common spaceflight materials. This method offers a practical way to protect high-vacuum facilities, reduce contamination hazards, and lower operational cost while providing a sustainable option for contamination-sensitive missions.