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 Subject : Thermal Shock of
 PDS 30182-2 Grafoil to
 Determine Outgassing
 Effects

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The periphery wrapper and slip plane of the A-6 and subsequent reactors are formed from PDS 30182-2 Grafoil strips using petrolatum as an assembly aid. This grade of foil exhibits higher strength characteristics than the degassed variety. To determine whether outgassing of the foil and vaporization of the petrolatum when exposed to reactor heat-up rates will cause catastrophic bubbling and/or cracking in the foil, three (3) tests were conducted in the 6 X 54 Furnace.

The specimens consist of 1 1/4 diameter pieces of the PDS 30182-2 Grafoil cemented together with petrolatum and sandwiched in a specimen holder under 30 psi. Additional layers were placed on top of the holder in an unloaded condition. Thermocouples were placed at the center of the foil sandwich and in the gas stream, to monitor temperature rise rates (Figure 1).

The thermal shock tests consist of preheating a 60-inch long heat exchanger to 5000°R, then flowing high velocity Helium at 80 SCFH (.89 lbs/min) through it onto the specimen mounted at the exhaust end. The fixture consists of heat exchanger, a unfueled element inserted in a graphite tube and a specimen holder, a graphite sleeve surrounded by a water jacket. The specimen holder provided a uniformly distributed 30 psi load on the inner foil pack. The outer foil pack was left unloaded because this was thought to be the most severe condition.

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The first test, which consisted of two (2) foil layers placed inside and two (2) on top of the holder, achieved 3600°R at a minimum rate of $100^{\circ}\text{R}/\text{Sec.}$ on the inner foils. The foil on the top of the holder was completely gone after the test and is believed caused by the force of the Helium blast, rather than any catastrophic outgassing due to thermal shock. The second specimen consisting of six (6) layers of foil inside and four (4) foil layers on top achieved a $100^{\circ}\text{R}/\text{Sec.}$ temperature rise to 3950°R on six (6) inner layers of foil and approximately $3000^{\circ}\text{R}/\text{Sec.}$ to 4190°R on the top mounted four (4) layers (Figure 2). Again, the topmost foil was missing with exception to the edge under the ring. This also is attributed to the force of the blast. The three (3) remaining foils were essentially intact (Figure 3).

The third test consisted of ten (10) layers of foil placed inside the holder under no-load conditions. This was accomplished by mounting a ring about the outer edge of the foil and clamping it in the holder. A temperature rise of $140^{\circ}\text{R}/\text{Sec.}$ to 3600°R was achieved.

In all tests, an insignificant bubbling of the foil was observed; however, at no time did catastrophic bubbling or cracking occur due to outgassing (Figure 3).

J. T. Malarky
Core Components & Thermal Experiments

/mf

Figure 1

PDS 30182-2 Grafoil Specimens Mounted in Thermal
Shock Test Hardware

MANI-THE-1851

WANL-TMI-1851

Figure 3

Test #2 Grafoil specimens after thermal shock.
Condition of specimens is typical of all tests.