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PYROLYSIS GAS CHROMATOGRAPHY

ANALYSIS OF 5 THERMO-LAG

FIRE BARRIER SAMPLES

Performed For:

Cleveland Electric Illuminating Company
10 Center Road
N. Perry, OH 44081

P. O. Number S138224

24 July 1995

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I. ABSTRACT

Inspection of the pyrograms of 5 Thermo-Lag fire barrier samples indicated that they are all similar in chemical composition.

II. OBJECTIVE

Pyrolysis Gas Chromatography (PGC) with Mass Selective Detection (MSD) was used to qualitatively compare five Thermo-Lag fire barrier samples.

III. DESCRIPTION OF METHOD

The samples were compared by pyrolysis gas chromatography using ASTM D3452 as a general guide. A Hewlett-Packard model 5890 series II gas chromatograph equipped with a Hewlett Packard model 5972 mass selective detector was used to generate chromatograms of the pyrolysis products. Pyrolysis of the Thermo-Lag samples were performed with a CDS pyroprobe mounted in an independently heated interface attached to the injection port of the GC. Analysis involved weighing 1-3 mgs. of sample in a quartz tube and placement of the tube in the platinum coil element of the probe. The probe is then placed in the interface and pyrolysed ballistically for 2 seconds. Pyrolytic products are then swept by the carrier gas onto the fused silica capillary column where they are separated and detected with a MSD. Chromatographic and pyrolysis conditions are shown in Table 1. Prior to each analysis, the column is heated to 250°C to elute any volatiles which were not entrained in the polymer.

IV. PRESENTATION OF RESULTS

The five pyrograms (total ion chromatograms) for each of the five Thermo-Lag samples are shown in Figures 1, 3, 5, 7 and 9. The extracted ion chromatograms using the acrylate base ion m/e of 55 common to ethyl acrylate (EA) and m/e of 69 common to methyl methacrylate (MMA) for each sample are shown in Figures 2, 4, 6, 8 and 10. The sample name at the top of each figure is the NUCON Log # I. D. Samples 0695-14 A-E are further identified in Table 2 along with their respective EA/MMA area ratios. Each set of figures is followed by a library search, which identifies some of the major peaks from each sample's pyrogram, and a summary area percent report.

V. DISCUSSION OF RESULTS

The average extracted ion area ratio for EA/MMA of 1.18 ± 0.07 ($\pm\sigma$) shown in Table 2 is consistent with the average area ratio of 1.3 ± 0.2 ($\pm 2\sigma$) obtained from other Thermo-Lag samples tested under the NEI generic testing program.

The extracted ion chromatograms shown in Figure 2 for sample 0695-14A, a 1 hour rated conduit sample, have an EA/MMA ratio of 1.21. Pyridine compounds identified in the pyrogram (Figure 1) are 3-methyl pyridine. Other key components identified are 2, 3, 4, 5-tetramethyl-1H-pyrrole, pentanedioic acid diethyl ester, octicizer and tris (methylphenyl) phosphate.

The extracted ion chromatograms shown in Figure 4 for sample 0695-14B, a 1 hour rated panel sample, have an EA/MMA ratio of 1.28. Pyridine compounds identified in the pyrogram are 3-methyl pyridine (visual inspection). Other key components identified are 2, 3, 4, 5-tetramethyl-1H-pyrrole (visual inspection), pentanedioic acid diethyl ester, octicizer and tris (methylphenyl) phosphate.

The extracted ion chromatograms shown in Figure 6 for sample 0695-14C, a trowel grade sample, have an EA/MMA ratio of 1.11. Pyridine compounds identified in the pyrogram (Figure 5) are pyridine, 3-methyl pyridine, 3, 5-dimethyl pyridine and 5-ethenyl-2-methyl pyridine. Other key components identified are 2, 3, 4, 5-tetramethyl-1H-pyrrole, pentanedioic acid diethyl ester, triphenyl phosphate, octicizer and tris (methylphenyl) phosphate.

The extracted ion chromatograms shown in Figure 8 for sample 0695-14D, a 1 hour rated conduit sample, have an EA/MMA ratio of 1.19. Pyridine compounds identified in the pyrogram (Figure 7) are 3-methyl pyridine (visual inspection) and 3, 5-dimethyl pyridine. Other key components identified are 2, 3, 4, 5-tetramethyl-1H-pyrrole (visual inspection), pentanedioic acid diethyl ester (visual inspection), octicizer and tris (methylphenyl) phosphate.

The extracted ion chromatograms shown in Figure 10 for sample 0695-14E, a one hour rated conduit sample, have an EA/MMA ratio of 1.13. Pyridine compounds identified in the pyrogram (Figure 9) are pyridine, 3-methylpyridine, 3, 5-dimethyl pyridine and 5-ethenyl-2-methyl pyridine. Other key components identified are 2, 3, 4, 5-tetramethyl-1H-pyrrole, pentanedioic acid diethyl ester, octicizer and tris (methylphenyl) phosphate.

In conclusion, the results indicate that the five Thermo-Lag samples are consistent in terms of chemical composition to other Thermo-Lag samples tested as part of the NEI generic testing program.

Location of the Thermo-Lag Radiant Energy Heat Shield

The NRC Project Manager for the Perry Nuclear Power Plant (PNPP) recently requested that the location of the Thermo-Lag radiant energy heat shield discussed in a February 11, 1994, letter to the NRC on Thermo-Lag issues (PY-CEI/NRR-1750L) be identified. This radiant energy heat shield is located in the Auxiliary Building on elevation 568', on the west side of the Reactor Core Isolation Cooling (RCIC) system instrument panel. It should be noted that this radiant energy heat shield is no longer required to protect the RCIC instrument panel because the safe shutdown analysis for this area has since been revised to utilize the Low Pressure Core Spray (LPCS) system as an alternative to the RCIC system. Further, Thermo-Lag is not used as a radiant energy heat shield anywhere inside the PNPP containment, as addressed in NRC Information Notice 95-27, NRC Review of Nuclear Energy Institute "Thermo-Lag 330-1 Combustibility Evaluation Methodology Plant Screening Guide."