

PROJECT NUMBER : 6908
PROJECT TITLE : Smoke Condensate Studies
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I. UNEXTRACTED NICOTINE STUDIES

- A. **Objective:** To determine whether there is a correlation between unextracted nicotine in filler and the delivery of NNK in MS smoke.
- B. **Results:** Flash heating studies (700°C in air and nitrogen) of various tobacco fillers continue. The study was extended to include materials which had been digested under acidic (1 N sulfuric acid) or basic (0.1 N and 1.0 N NaOH) conditions in addition to water-washing at various temperatures. Analysis of the results continues. The following preliminary observations have been made. (1) Using standard solutions, the recovery of each TSNA has been shown to vary according to digestion conditions. Recovery of NNN, NAT, and NNK following acidic treatment are greater than 80% while the recovery of NDHA (the internal standard) is only 50%. In base, NAT is very unstable. While the others are recovered at greater than 69%, NAT is almost entirely decomposed. (2) NNK delivery relative to TPM is different when pyrolysis occurs in air relative to nitrogen. However, when corrected for percent particulate phase in TPM, NNK delivery is the same for the two pyrolysis conditions. The NNK, therefore, appears to be associated with the generated particulate phase.
- C. **Plans:** Complete data analysis and determine relationships between TSNA, the particulate phase, and TPM. Expand study to other burley tobacco based fillers. Begin experiments on flash heating of TPM.
- D. **Reference:**
- Morgan, W. R. Notebook No. 8905, p. 74.

II. REDUCTION OF MS TSNA BY REDUCING PREFORMED TSNA AND PYROSYNTHETIC TSNA PRECURSORS IN FILLER

- A. **Objective:** Alter physical/chemical parameters which may be responsible for the appearance of TSNA in MS smoke.
- B. **Results:** Analyses of the burley components fillers have begun. Four burley grades from crop years 1988-1990 are being evaluated to determine if there are any factors relevant to tobacco grade which might influence TSNA. Initial results indicate remarkably similar alkaloid and preformed NNN and NAT levels. NNK levels show a much larger variation. MS TSNA has also begun but not even preliminary conclusions are yet possible.

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The 3, 6, and 9 puff MS TSNA delivery of a cigarette composed of base web made from 100% burley stems has been determined. Results are similar to that observed for 1R4F and DBC filler. TPM rises in the last section due to evolution of condensable vapor components (mostly water). Condensable vapor phase components do not appear to be directly associated with TSNA delivery. As is indicated in the previous section for NNK, there may be a relationship between the particulate phase and TSNA delivery but more work is clearly needed to understand the actual processes involved.

C. Plans: Continue the chemical and physical evaluation of the burley fillers. Extend the 3,6,9-puff study to other cigarettes composed of bright and oriental tobaccos.

D. Reference:

Haut, S. A. Notebook No. 9078, p. 89.

III. ANALYTICAL PROCEDURES

A. Objective: To develop and maintain analytical methodology for TSNA or other compound classes where information is needed for determining relationships of TSNA to their precursors.

B. Results: Studies are continuing, in conjunction with ARD, relating to the identification of individual nitrosamines in aged smoke. It has been observed that the more refined a smoke sample becomes the broader are the resulting chromatographic peaks upon GC-TEA analysis using a DB-5 column. This broadening was not observed on a DB-WAX column. Under certain circumstances, it is clearly advantageous to use the DB-WAX column even though the analysis time is considerably extended.

The 5880 GC has been completely refurbished. New nickel gas lines have been installed and the injector and NPD detector rebuilt. The interface to the MSD detector has been reconfigured to optimize sensitivity and a new high capacity roughing pump has been ordered.

An analytical supercritical fluid extractor has been installed and work is being initiated to develop a procedure for TSNA analysis based on this technique.

C. Plans: Continue studies of aged smoke. Continue to upgrade current analytical instrumentation for maximum efficiency. Begin experiments to optimize the SCF extraction of tobacco samples for TSNA determinations.

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D. References:

1. Morgan, W. R. Notebook No. 8905, p. 74.
2. Forte, R. A. Notebook No. 9133, p. 46.
3. Haut, S. A. Notebook No. 9078, p. 89.

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