

DICFT respectively. The effects that salt casing produces such as lowered TPM and, in this study, lowered HCN cannot be accounted for by differences in mainstream tobacco consumption. This subject is still under investigation.

CHARGE NUMBER: 0108

PROGRAM TITLE: MECHANISM FOR SMOKE FORMATION

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PROJECT LEADER: W. R. Johnson

DATE OF REPORT: June 2, 1972

I. TOLUENE: BENZENE RATIOS IN CIGARET SMOKE

Toluene: benzene ratios in cigaret smoke have been previously reported to be 2.2 in the sidestream smoke and 1.7 in the mainstream smoke of burley, bright, Turkish, and KY 1R1 cigalets. However, the values obtained for a cigaret made of pipe tobacco were 3.7 and 1.6 for the two streams.¹

In order to establish whether these differences were due to substrate composition or physical differences present during smoking, all fillers above were pyrolyzed at 700°C.² Within experimental error, ratios were identical, being 1.15, 1.17, 1.13, and 1.18 for bright, burley, Turkish and pipe tobacco respectively. On this basis, differences are attributed to physical conditions (e.g. temperature) rather than to filler composition.

Kentucky 1R1 filler was pyrolyzed at temperatures of 600 - 950°C at 50° intervals.² A plot of the log of the absolute temperature vs the log of the toluene:benzene ratio yielded a straight line of slope -0.11. The absolute temperature and the ratios are related by the equation:

(a) $\log T = 0.11 \log \gamma + 2.991$ where

$$\gamma = \frac{\text{toluene } (\mu\text{g})}{\text{benzene } (\mu\text{g})} \text{ or}$$

(b) $T (^{\circ}\text{K}) = 980 \gamma^{-0.11}$

This equation can be compared to one derived from thermocouple measurements of peak coal temperatures:³

$T (^{\circ}\text{C}) = 750 \gamma^{-0.07}$ where

$$\gamma = \frac{O_2 \times CO_2}{N_2 \times CO} \quad (\text{in vol. \%})$$

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4	B. Miller	5450	65
5	W. Johnson	4361	61,66
6	R. W. Hale	5325	62-66
7	S. Clough	5340	19-21
8	P. Chen	5403	27,28,30
9	J. C. Kang	5213	80-82

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From the log, log plot, the average temperature of formation of benzene and toluene can be determined to be 587°C for sidestream smoke from a cigaret made from pipe tobacco (ratio = 3.7) and 727°C for mainstream smoke from a handmade 600mg cigaret made of Kentucky 1R1 filler (ratio = 0.9).

II. PYROLYSIS OF MH-30

More than forty-five products have been identified in the pyrolysis of MH-30 (maleic hydrazide).^{4,5} A summary of this work has been compiled.⁶ Studies related to mechanism of breakdown continue. The search for hydrazine continues to no avail.

III. REFERENCES

- 1 W. Johnson, Monthly Progress Report, May 17, 1972. Acc. #72-056.
- 2 H. Grubbs - 5487 63-67
- 3 Boyd, et al., 22nd Tobacco Chemists' Research Conference, Richmond, October, 1968.
- 4 S. C. Clough 5598 37,38,40,44-49
- 5 R. Kornfeld 5590 38
- 6 Memo - Members- Project 0108 to T. S. Osdene May 12, 1972.

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