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Title: PLATINUM AS AN ADDITIVE TO TOBACCO

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PLATINUM AS AN ADDITIVE TO TOBACCO

1. INTRODUCTION

Representatives of Johnson, Matthey Co. Ltd., have pointed out that platinum catalyses the oxidation of various hydrocarbon bodies including aromatic hydrocarbons and have suggested that the addition of a minute amount of a relatively thermally unstable platinum compound to cigarette tobacco would have some effect on the products arising from the combustion. This could be by catalytic oxidation; alternatively, the effect could be deleterious by promoting the formation of complex molecules from free radicals.

A small-scale trial was arranged in which would be investigated

- a. The quantity of benzpyrene in cigarette smoke
- b. The total quantity of tar produced

Messrs. Johnson, Matthey supplied a sample of platinum diammino-nitrite ( $(\text{NH}_3)_2 \text{Pt}(\text{NO}_2)_2$ ), which is a water soluble compound decomposing at 300-400°C into elementary platinum, ammonia and oxides of nitrogen.

2. ADDITION OF PLATINUM COMPOUND TO TOBACCO

The suggested maximum loading (0.1% platinum to dry weight of tobacco) was employed and the platinum compound in water was sprayed onto a 15 lb. sample of cut <sup>Virginian</sup> tobacco ["Player's Medium" blend] using an atomising spray. Owing to the limited solubility (0.4%) of the platinum

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compound in water, it was necessary to make repeated applications and the following scheme was adopted.

(i) 15 lb. of cut tobacco, at 11-12% moisture content, was sprayed with a portion of the platinum solution until the moisture content reached 17-18%.

(ii) This material, at 17-18% moisture content, was dried in a hot air drier until the moisture content was 10-11%.

(iii) This cut tobacco was resprayed with a second portion of platinum solution . . . . . and so on.

This procedure was repeated until the required amount of platinum compound had been applied. Eight or nine applications were required and a somewhat marked degradation in rag length occurred during the redrying process.

The control sample of 15 lb. cut tobacco was treated in the same fashion, using an equal volume of water in place of the platinum solution, the remark as to rag degradation applying here equally.

### 3. CIGARETTE MAKING

A machine adapted to work with considerably smaller quantities of rag (i.e. 10-15 lb.) was used and cigarettes were made from both the platinum-treated and control samples of tobacco, care being taken to avoid contamination of one sample with the other. 1000 cigarettes from each sample were selected within  $\pm 2\%$  of  $26\frac{1}{2}$  cigarettes/oz.

### 4. SMOKING AND SMOKE ANALYSIS

Cigarettes were smoked mechanically, using a 15 ml. puff of 2 sec. duration, 4 times a minute, and the smoke was collected by

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electrostatic precipitation. For the assay of 3,4-benzpyrene, the smoke condensate was fractionated chromatographically on alumina and silica gel, the presence of benzpyrene in the various fractions being established by recording the fluorescence spectra. Benzpyrene was then estimated in the purified concentrate by means of fluorescence spectrophotometry.

5. RESULTS

	<u>Control</u>	<u>Platinum-sprayed</u>
Benzpyrene content/500 cigarettes	10-12 $\mu$ g.	(i) 4-6 $\mu$ g. (ii) 7-8 $\mu$ g.
Weight of whole smoke per cigarette	37.9 mg.	38.4 mg.
Burning rate (mm./min.)	4.2	3.9

6. DISCUSSION OF RESULTS

Within the limits of experimental error there is no reduction in the amount of tars produced by a cigarette. There is some reduction in the benzpyrene content, but it is felt that this is insufficient to warrant the use of platinum for this purpose, and might well be due to the presence of ammonia or nitrogen oxides, arising from the decomposition of the platinum salt used. The difference between the burn rates is probably insignificant, but could be interpreted as an indication of some catalytic effect. It would seem fair to assume that if the platinum in the added compound has an effect on tar production, it is only on a very minor fraction of the total tar. It could be that this fraction includes the aromatic polycyclic hydrocarbons but further work would be necessary to establish this point. The bulk of the smoke tars are

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unaffected and this may be due to:

(i) poisoning of the catalytic surface by distillation and decomposition products produced by the burning of the tobacco and moving down the cigarette in advance of the combustion zone.

(ii) loss of catalyst by transfer to the gas stream.

Samples of tobacco, smoke tar, ash and butts from both groups of cigarettes have been sent to Johnson, Matthey Co.Ltd., to enable them to make a platinum recovery balance sheet. This is desirable in order to determine the possible extent of any hazard due to the carry-over of platinum compounds into the mouth of the smoker. Certain people are susceptible to "platinum-asthma" through the inhalation of volatile compounds of platinum.

#### 7. SMOKE TASTE

Compared with the control cigarettes, those which had been treated with platinum had lost some of their characteristic flavour on smoking and, moreover, had acquired an after-taste, best described as insipid and either metallic or earthy. They were definitely unpleasant to smoke compared with the normal product.

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