TOBACCO COMPOSITION AND SMOKING UNIT CONTAINING MATERIAL FOR ELIMINATING DELETERIOUS MATTER

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This invention relates to smoking compositions and to smokeable units including therein a novel particulate inorganic material intimately associated with tobacco, the additives being capable of substantially reducing the quantity of tars normally generated during the burning of the tobacco and improving the aroma of tobacco. For many reasons, clinical and aesthetic, reduction in the tar yield during the smoking of tobacco is highly desirable. First, there exists strong clinical, statistical and pathological evidence that certain constituents of tobacco smoke condensate (or "tars") as such condensate is usually termed) are potentially carcinogenic when deposited on human tissue. These carcinogens have been reported to be mixtures of essentially neutral high-molecular weight polycyclic hydrocarbons, the carcinogenic potency of any mixture depending on the species present. Several general types of polycyclic aromatic hydrocarbons are usually present in tobacco smoke condensate and undoubtedly many individual molecular species are hence present. Deleterious polycyclic hydrocarbons are undoubtably of pyrogenic origin since they cannot be isolated from raw tobacco prior to the pyrolysis thereof. These noxious substances are ordinarily carried as dispersed droplets or solid particles in the effluent smoke stream and thence into the smoker's respiratory system along with the aroma and taste producing constituents of the smoke. Secondly, aside from their alleged pathological effect, it appears that certain constituents of tars are responsible for the sharp irritating taste imparted to smoke from a cigarette or the like. Furthermore, tars produce disfiguring coloration of the teeth of many smokers and, if only for this reason, the lowering of total tars yielded during smoking is highly desirable.

Many efforts have been made in the past to reduce the yield of tars in the effluent smoke of tobacco. The use of filter-tips, for example, has met widespread acceptance both by the cigarette industry and the consumer. Another method involves the commingling with smoking tobacco of particulate porous solids having high sorptive capacity, and virtue of their large specific surface, internal or external. The inclusion in smoking mixture of a variety of sorptive clays, colloidal and non-colloidal, and various forms of sorptive aluminum gels has been suggested in the prior art. Reduction of tobacco oils, nitrogenous bases and tars in the smoke have been among purported benefits although reproducible quantitative evidence capable of being correlated with in vivo smoking conditions has not been set forth in support of purported benefits. The tobacco industry has apparently failed to find that the inclusion in tobacco compositions of such particulate solids as have been proposed heretofore to be of sufficient value to warrant their use in commercial smoking mixtures.

It is apparent that smoking mixtures which include an innoxious additive which is capable of substantially lowering the tar yield of said tobacco when smoked meets a long-felt need of the tobacco smoker. Accordingly, it is a principal object of the instant invention to provide a composition including tobacco which incorporates a novel aluminum additive which functions during the pyrolysis of the tobacco to reduce substantially the quantity of tars in the smoke effluent from said tobacco.

Another object of the invention is the provision of a composition including tobacco intimately associated with an innoxious aluminum additive capable at the elevated temperatures encountered in smoking tobacco of substantially lowering the yield of tars in the main stream smoke of tobacco.

It is another important object to provide smoking units including tobacco and a particular aluminum additive dispersed through said tobacco and capable of curtailing the quantity of tar generated during pyrolysis of said tobacco.

Other objects will be apparent from a reading of a description of the invention which follows.

I have discovered that substantial benefits are realized when certain classes of crystalline aluminum materials are included in tobacco mixtures. Briefly, compositions of my invention comprise tobacco intimately associated with at least one crystalline form of alumina selected from the group consisting of unused alpha-alumina, gamma-alumina, transitional crystalline forms of alumina intermediate gamma- and alpha-alumina, beta-alumina hydrate and alpha-alumina monohydrate. The tobacco additives within the compass of my invention are considered by competent contemporary authorities to be innoxious when inhaled or otherwise orally administered. Tobacco compositions made in accordance with the subject invention are characterized by a smooth essentially blemish-free taste when smoked. The smoke effluent from said compositions is distinguished by a tar content substantially lower than that of a smoking mixture including the same tobacco species or species but devoid of the novel additive. Other aluminum additives have been intimately associated with smoking tobacco and the smoke effluent from the mixture analyzed by in vitro method capable of reproducing in vivo smoking conditions; it has been found that such additives do not produce the outstanding benefits which are realized by use of an additive within the scope of the invention. I have found, for example, that bauxite, which comprises gibbsite (alpha-alumina hydrate) is not an effective additive in either its naturally-occurring or thermally-activated state. Furthermore, I have found that pure crystalline alpha-alumina trihydrate actually increases the tars generated from a given weight of tobacco.

In accordance with my invention a minor amount of additive selected from the above defined group of aluminum materials is intimately associated with tobacco. From about 1 to 15% of additive, based on the weight of tobacco may be used in tobacco compositions of my invention although from about 2 to 10% will ordinarily be used. The optimum quantity of aluminum additive will vary with specie and method of preparation thereof and will also vary with the type and quality of tobacco used and the moisture content of the composition. The tobacco may be leaf, reconstituted tobacco or mixtures thereof and may be treated and cut for use in cigarettes, pipes or cigars. However maximum benefits are ordinarily attained when the novel additive is employed in a cigarette and, accordingly, the invention will be described with particular reference to cigarettes and tobacco mixtures suitable for use in cigarettes.

The various aluminas and hydrates thereof which are within the compass of my invention are well described in a publication by Aluminum Company of America, Russell, Allen S., "Alumina Properties," Technical Paper No. 10 (1953).

Alpha-alumina monohydrate occurs naturally as the mineral boothnite. Under suitable conditions it may be prepared by partial dehydration of the trihydrate of alpha-alumina. The conversion is rapid when the trihydrate is
heated in dilute aqueous solution at about 200° C. or by heating the trihydrate rapidly above about 450° C.

Beta-alumina trihydrate, a synthetically prepared compound, has no naturally-occurring counterpart. The material is sometimes called "bayerite" because of the mistaken assumption of past researchers that it is the form of fused alumina produced in the well known Bayer process. Beta-alumina trihydrate is produced by several methods including the neutralization of a sodium aluminate with carbon dioxide at 20–30° C. under conditions such as to effect rapid precipitation. It has been found that slow precipitation does not produce the desired compound. Beta-alumina trihydrate may also be formed by precipitation of alumina by alkali from solutions of aluminum salts.

Unfused alpha-alumina exists in various crystalline forms, one of the most useful of which in compositions within the scope of the instant invention is tabular alumina. Tabular alumina is commercially prepared by calcining alumina from the Bayer process to a temperature not far below the fusion temperature. In the Bayer process bauxite is digested with hot caustic solution to put the alumina into solution as sodium aluminate. Alumina trihydrate is precipitated from solution and is treated by calcination and reduction to yield the pure aluminum. Tabular alumina has the crystal form of corundum and retains its porosity to elevated temperatures in the range of the fusion point of alumina. Other useful forms of alpha-alumina include variously prepared crystalline materials which have not been subjected to fusion. Another particularly useful specie of alpha-alumina is prepared by calcination of diaspore.

Gamma-alumina is not found in nature but is produced when the trihydrates of alumina or the gamma-monohydrate are heated to a high temperature to lose combined water and, on further heating, to a temperature of the order of 900° C. or above. Tabular alumina, which, on further heating, temperatures above 1000° C. converts to alpha-alumina. The transition temperature from gamma-alumina to tabular alumina is not sharply defined and intermediate forms of alumina may be recognized by X-ray diffraction patterns, such intermediate forms being useful in tobacco compositions of my invention. Gamma-alumina and transitional intermediate aluminas are characterized by a water content which is finite but less than that corresponding to the monohydrate. Gamma-alumina may also be produced by the controlled oxidation of alumina in the aluminous additive is preferably incorporated in cigarette tobacco in comminuted form, usually less than about 300-mesh and preferably having a preponderating portion less than about 10 microns. In general, the more finely divided the aluminous additive the greater the adhesion to tobacco particles. Of course the particular particle size used in a composition will depend on such factors as moisture content, presence of tacky humectants or other binder, mode of application to tobacco, size of tobacco particles, presence and nature of filter-device and locus of additive placement.

The aluminous additive may be distributed substantially uniformly throughout the body of the cigarette or, as in an embodiment of the invention, the material may be placed selectively within the cigarette to effect maximum benefits. Accordingly, the material may be advantageously placed throughout the cigarette with maximum content 2 to the interior end, where, during the smoking of the cigarette, maximum tar deposition is encountered.

A filter, either of the well-known type which is integral with the smoking unit or of the holder type including a filter, is preferably employed in a smoking unit comprising an aluminous additive. The filter may be fibrous and/or include absorbents such as silica, clay or the like. The purpose of the filter is to prevent any inspiration of finely-divided particles which may occur if the smoking unit is subjected to dry warm weather for prolonged periods. The filter imposes a bed of material capable of entraining the particle which might otherwise be drawn into the smoker's mouth. However, by proper selection of moisture content and, in some cases, inclusion of about 2–4% (based on the weight of the tobacco) of humectant or by otherwise bonding the additive to the tobacco surface the filter may be omitted. When adhesion of the additive to the tobacco is inadequate a binder may be used to improve adhesion between the tobacco and the additive.

The following embodiments of my invention are given only for the sake of more fully illustrating the invention and are not to be construed as limiting the scope thereof.

Example I

A cigarette of my invention is prepared by dispersing 0.05 gram of 300-mesh tabular alumina with 1.0 gram of whole leaf tobacco shreds previously cased and humectated. The mixture is packed into a column tobacco-paper and a fibrous filter-tip is provided at an end of the packed column.

Example II

Another composition of my invention is prepared by spraying an aqueous slurry of finely-divided boehmite onto whole leaf tobacco shreds blended with reconstituted shredded tobacco to deposit 10 parts of boehmite on 100 parts of blended tobacco shreds.

Example III

The invention is further illustrated by substituting beta-alumina trihydrate, finely-divided, for the tabular alumina of Example I.

Example IV

Gum arabic solution is used to bind comminuted microporous gamma-alumina to tobacco leaf. Gamma-alumina suspended in a dilute gum arabic solution is used to coat stemmed aged tobacco leaf and sufficient moisture is evaporated to affix the gamma-alumina to the leaf. The leaf thus treated may be suitably cut and processed for use in cigarette, pipe or cigar smoking compositions.

It will be understood that the invention is not limited to compositions provided by dry dusting of additive onto tobacco since the additive may be associated with the tobacco by spraying in water or a suitable binding liquid or by immersion techniques. Furthermore it is within the scope of my invention to include the additive in reconstituted tobacco by forming comminuted tobacco and aluminous additive into a coherent mass in the presence of a suitable binder.

Obviously, many modifications and variations of the invention as hereinbefore set forth may be made without departing from the spirit and scope thereof, and therefore, only such limitations should be imposed as are indicated in the appended claims.

I claim:

1. A smoking mixture comprising a major portion of tobacco and intimately associated with at least a portion of a finely-divided alpha-alumina component comprising fused alpha-alumina.

2. The smoking mixture of claim 1 in which said finely-divided alpha-alumina component comprises unfused alpha-alumina.

3. The smoking mixture of claim 1 in which said finely-divided aluminous material comprises crystalline alpha-alumina.

4. The smoking mixture of claim 1 in which said finely-divided aluminous material comprises a transition crystalline form of alumina intermediate gamma- and alpha-alumina.
5. The smoking mixture of claim 1 in which said finely-divided aluminous material comprises beta-alumina trihydrate.

6. The smoking mixture of claim 1 in which said finely-divided aluminous material comprises alpha-alumina monohydrate.

7. A smoking mixture comprising a major portion of particulated tobacco and dispersed throughout said tobacco and intimately associated therewith from 1 percent to 15 percent by weight of at least one finely-divided crystalline aluminous material selected from the group consisting of unfused alpha-alumina, gamma-alumina, transitional crystalline forms of alumina intermediate gamma- and alpha-alumina, beta-alumina trihydrate, and alpha-alumina monohydrate.

8. The smoking mixture of claim 7 in which said finely-divided aluminous comprises unfused alpha-alumina.

9. The smoking mixture of claim 7 in which said finely-divided aluminous material comprises gamma-alumina.

10. The smoking mixture of claim 7 in which said finely-divided aluminous material comprises a transitional crystalline form of alumina intermediate gamma- and alpha-alumina.

11. The smoking mixture of claim 7 in which said finely-divided aluminous material comprises beta-alumina trihydrate.

12. The smoking mixture of claim 7 in which said finely-divided aluminous material comprises alpha-alumina monohydrate.

13. A smoking unit comprising a column of tobacco and dispersed throughout at least a portion of said tobacco and intimately associated therewith from 1 percent to 15 percent by weight of at least one finely-divided crystalline aluminous material selected from the group consisting of gamma-alumina, alpha-alumina, transitional crystalline forms of alumina intermediate gamma- and alpha-alumina, beta-alumina trihydrate and alpha-alumina monohydrate.

14. A cigarette comprising a column of particulated tobacco, said column terminating in a filter-tip, and distributed throughout at least that portion of said column contiguous said filter-tip from 1 percent to 15 percent by weight of at least one finely-divided crystalline aluminous material selected from the group consisting of unfused alpha-alumina, gamma-alumina, transitional crystalline forms of alumina intermediate gamma- and alpha-alumina, beta-alumina trihydrate and alpha-alumina monohydrate.

15. The cigarette of claim 14 in which the aluminous material comprises gamma-alumina.

16. The cigarette of claim 14 in which the aluminous material comprises unfused alpha-alumina.

17. The smoking mixture of claim 14 in which said finely-divided aluminous material comprises a transitional crystalline form of alumina intermediate gamma- and alpha-alumina.

18. The smoking mixture of claim 14 in which said finely-divided aluminous material comprises beta-alumina trihydrate.

19. The smoking mixture of claim 14 in which said finely-divided aluminous material comprises alpha-alumina monohydrate.

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