NEW COMPOSITION TO DRASTICALLY REDUCE TOXIC COMPOUNDS IN TOBACCO SMOKE

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ABSTRACT

The Polymer Processing and Pyrolysis research group at the University of Alicante has developed a synergistic mixture of tobacco and additives based on mesoporous compounds and alkaline or alkaline earth metal salts of carboxylic acid, which significantly reduces toxic and carcinogenic substances present in tobacco smoke, among them: 90% of tar, 70% of nicotine and 50% of carbon monoxide, among others. This new composition is stable and allows much greater reductions than those currently achieved with other similar systems. This mixture can be manufactured at industrial level automatically using the same conventional equipment (without significant modifications), on any type of tobacco: conventional, reconstituted, expanded, rolling and pipe. We are looking for companies interested in acquiring this technology for commercial exploitation.

INTRODUCTION

Tobacco use represents a major public health problem worldwide. More than 6,000 compounds have been identified in tobacco smoke, and approximately 100 of those are recognized as toxic or carcinogenic by the Food and Drug Administration (FDA).

The toxicity of tobacco smoke is recognized in all areas, and there is currently intensive research to reduce toxic compounds inhaled by smokers.

Certain substances have been described in the scientific and patent literature that have the capacity to modify combustion and reduce the emission of toxic compounds (nitrogen oxides, carbon monoxide (CO), hydrocyanic acid (HCN), nicotine, tar, benzopyrenes, acetone, phenol, nitrosamines, polyaromatic compounds, etc.) during tobacco smoking process, among them:

- Potassium ion (K^+), in the form of a salt other than nitrate.
- Potassium salts of carboxylic acids.
- Potassium citrate.
- Activated carbon particles coated with calcium citrate.
- Alkaline metal salts of tetracarboxylic acids.
- Potassium citrate, tartrate or malate.
- Mesoporous aluminosilicates type MCM-41, SBA-15 and mesoporous carbons of high activation degree.

All these additives, mixed with tobacco, reduce CO by 30%, and nicotine and tar by up to 80%. However, for this purpose, it is necessary to use **concentrations higher than 6% by weight**.

Therefore, there is a need to find compounds that, added to tobacco, reduce the emission of toxic compounds (nicotine, tar, CO and other components) from tobacco smoke significantly.

TECHNICAL DESCRIPTION

This invention solves the problems described above.

It is a **mixture** that comprises:

1. **Tobacco.**

2. A series of **additives** which, when used together, give rise to a marked synergistic effect in the **reduction of toxic and carcinogenic compounds present in tobacco smoke**, among them:

- Tars.
- Nicotine.
- Carbon monoxide (CO).
- Other components of the gaseous and particulate fraction of the smoke.

Among these additives are:

a) At least, one **mesoporous compound**, hereinafter "catalyst", at a certain concentration, selected from among:

- Aluminosilicate type SBA-15.
- Aluminosilicate type MCM-41.
- Activated carbon with a high degree of activation.

b) At least, one **alkaline or alkaline earth metal salt of carboxylic acid**, at a certain concentration.

In addition, optionally, the mixture may contain, at least, one of the following compounds: water, glycerin, ethylic alcohol, pigments, flavors and odorants.

To carry out the mixing, the **procedure** is the following:

I. Sufficient volume of alkaline or alkaline earth metal salt of carboxylic acid (in the form of a concentrated solution) is added to the tobacco strands so that, after evaporation of the water, the desired concentration and some adhesion/greasiness are obtained.

II. Add the selected mesoporous compound(s) directly on the tobacco.

III. Mix manually or automatically.

ADVANTAGES AND INNOVATIVE ASPECTS

The present invention has the following advantages:

1) The mixture object of the present invention has a surprising synergistic effect, obtaining excellent results in the reduction of toxic and carcinogenic compounds during the tobacco smoking process, much higher than those reached by other catalysts described at the present time.

COMPOUND	MAGNITUDE OF THE REDUCTION
Tars	90%
Nicotine	70%
Carbon monoxide (CO)	50%
Other toxic components of the gaseous stream	50%
Some condensed liquids	100%

2) The wetting and adherent effect of the alkaline or alkaline earth metal salt of carboxylic acid made the mixture of tobacco with the mesoporous compound more effective, resulting in a more stable final product.

3) The process of incorporating the catalyst on the tobacco is greatly simplified, allowing automated industrial scaling using conventional equipment without any significant modification.

4) The dispersion of the catalyst on the tobacco is improved.

5) The stability of the mixture [tobacco + catalyst] is increased.

6) It increases the effectiveness of the catalyst in the reduction of harmful compounds present in tobacco smoke.

INNOVATIVE ASPECTS OF THE TECHNOLOGY

The simultaneous and combined addition of mesoporous solids (type SBA-15, MCM-41 and activated carbons) with alkaline or alkaline earth metal salts of carboxylic acid on tobacco, has a surprising synergistic effect with excellent results in the reduction of toxic and carcinogenic compounds present in tobacco smoke, which was not foreseeable with respect to their addition

separately.

It is worth noting the **reduction of the following compounds**:

- Tars: 90%
- Nicotine: 70%
- Carbon monoxide (CO): 50%
- Other gases: 50%
- Condensed liquids: 100%

CURRENT STATE OF DEVELOPMENT

This technology has been **successully prototyped** and developed in a **pilot plant scale**.

Fifteen cigarettes of each sample studied were smoked, following the technical specifications of ISO 3308 (2-second puffs, suction volume of 35 mL, puff frequency of 60 seconds, and pressure loss in puff less than 300 Pa), and it was concluded that the mixture object of the present invention allowed to obtain reductions of 90% in tar, 70% in nicotine, and 50% in carbon monoxide (CO), that is, **reductions much higher than those currently achieved with other catalysts**.

MARKET APPLICATIONS

This invention is framed within the **tobacco sector** (**cigarette** manufacturing), in particular, preparation of a synergistic mixture of tobacco and additives (mesoporous compounds and salts of alkaline metals or alkaline earth salts of carboxylic acid), which significantly reduces the toxic and carcinogenic substances present in tobacco smoke.

This technology can be applied, both **manually** and **automatically** to:

- Conventional tobacco.
- Reconstituted tobacco.
- Expanded tobacco.
- Rolling tobacco.
- Tobacco of pipe.
- Tobacco mixtures.

COLLABORATION SOUGHT

We are looking for companies interested in acquiring this technology for commercial exploitation through:

- Patent licensing agreements.
- Development of new applications.
- Agreements regarding technology and knowledge transfer.

Company profile sought:

Manufacturers and/or sellers of:

- Conventional tobacco.
- Reconstituted tobacco.
- Expanded tobacco.
- Rolling tobacco.
- Tobacco of pipe.
- Tobacco mixtures.
- Cigarettes.
- Cigars.

INTELLECTUAL PROPERTY RIGHTS

The present invention is protected by a **utility model application**:

- Title: "Mezcla de tabaco con una composición sinérgica de aditivos y sales de ácidos carboxílicos para reducir la generación de compuestos tóxicos en el humo del tabaco".
- Application number: U201931018.
- Application date: 1st June, 2018.

MARKET APPLICATION (4)

Pollution and Environmental Impact
Materials and Nanotechnology
Medicine and Health
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