smoking article comprising: a combustible first layer comprising carbon; and a second layer in direct contact with the first layer, the second layer comprising carbon and at least one ignition aid, wherein the first layer and the second layer are longitudinal concentric non-fibrous layers having an apparent density of at least 0.6 g/cm^3 and wherein the composition of the first layer is different from the composition of the second layer.

According to the invention there is also provided a smoking article comprising a multilayer combustible heat source according to the invention; and an aerosol-forming substrate downstream of the multilayer combustible heat source.

As used herein, the term 'direct contact' is used to indicate that the second layer touches the first layer and that there are no intervening layers between the first layer and the second layer.

As used herein, the term 'ignition aid' is used to denote a material that releases one or both of energy and oxygen during ignition of the combustible heat source, where the rate of release of one or both of energy and oxygen by the material is not ambient oxygen diffusion limited. In other words, the rate of release of one or both of energy and oxygen by the material during ignition of the combustible heat source is largely independent of the rate at which ambient oxygen can reach the material. As used herein, the term 'ignition aid' is also used to denote an elemental metal that releases energy during ignition of the combustible heat source, wherein the ignition temperature of the elemental metal is below about 500 °C and the heat of combustion of the elemental metal is at least about 5 kJ/g.

As used herein, the term 'ignition aid' does not include alkali metal salts of carboxylic acids (such as alkali metal citrate salts, alkali metal acetate salts and alkali metal succinate salts), alkali metal halide salts (such as alkali metal chloride salts), alkali metal carbonate salts or alkali metal phosphate salts, which are believed to modify carbon combustion. Even when present in a large amount relative to the total weight of the combustible heat source, such alkali metal burn salts do not release enough energy during ignition of a combustible heat source to produce an acceptable aerosol during early puffs.

As used herein, the term 'aerosol-forming substrate' is used to describe a substrate capable of releasing upon heating volatile compounds, which can form an aerosol. The aerosols generated from aerosol-forming substrates of smoking articles according to the invention may be visible or invisible and may include vapours (for example, fine particles of substances, which are in a gaseous state, that are ordinarily liquid or solid at room temperature) as well as gases and liquid droplets of condensed vapours.

As used herein, the terms 'upstream' and 'front', and 'downstream' and 'rear', are used to describe the relative positions of components, or portions of components, of smoking articles according to the invention in relation to the direction in which a user draws on the smoking articles during use thereof. Smoking articles according to the invention comprise a mouth end

sufficient heat is available to be transferred from the combustible heat source to the aerosol-forming substrate of the smoking article and so facilitates production of an acceptable aerosol during early puffs thereof.

The subsequent decrease in temperature of the multilayer combustible heat source following the decomposition of the at least one peroxide or superoxide is also reflected in a subsequent decrease in temperature of the multilayer combustible heat source to a 'cruising' temperature. In use in a smoking article according to the invention, this advantageously prevents or reduces thermal degradation or combustion of the aerosol-forming substrate of the smoking article.

The magnitude and duration of the boost in temperature resulting from the decomposition of the at least one peroxide or superoxide may be advantageously controlled through the nature, amount and location of the at least one peroxide or superoxide in the multilayer combustible heat source. In particular, by providing different amounts of at least one peroxide or superoxide in the combustible first layer and the second layer of multilayer combustible heat sources according to the invention, the magnitude and duration of the boost in temperature resulting from the decomposition of the at least one peroxide or superoxide may be advantageously controlled so as to produce an acceptable aerosol during early puffs of smoking articles according to the invention while still providing an acceptable aerosol during late puffs thereof.

Suitable peroxides and superoxides for inclusion in multilayer combustible heat sources according to the invention include, but are not limited to, strontium peroxide, magnesium peroxide, barium peroxide, lithium peroxide, zinc peroxide, potassium superoxide and sodium superoxide.

Preferably, the at least one peroxide is selected from the group consisting of calcium peroxide, strontium peroxide, magnesium peroxide, barium peroxide and combinations thereof.

In certain embodiments, the combustible first layer comprises carbon and the second layer comprises carbon and at least one peroxide.

In certain preferred embodiments, the combustible first layer comprises carbon and at least one peroxide and the second layer comprises carbon and at least one peroxide, wherein the ratio by dry weight of carbon to peroxide in the combustible first layer is different from the ratio by dry weight of carbon to peroxide in the second layer.

In one preferred embodiment, the combustible first layer comprises carbon and at least one peroxide and the second layer comprises carbon and at least one peroxide, wherein the ratio by dry weight of carbon to peroxide in the combustible first layer is greater than the ratio by dry weight of carbon to peroxide in the second layer.

In certain particularly preferred embodiments, the combustible first layer comprises carbon and calcium peroxide and the second layer comprises carbon and calcium peroxide,

wherein the ratio by dry weight of carbon to calcium peroxide in the combustible first layer is different from the ratio by dry weight of carbon to calcium peroxide in the second layer.

In one particularly preferred embodiment, the combustible first layer comprises carbon and calcium peroxide and the second layer comprises carbon and calcium peroxide, wherein the ratio by dry weight of carbon to calcium peroxide in the combustible first layer is greater than the ratio by dry weight of carbon to calcium peroxide in the second layer.

Layers of multilayer combustible heat sources according to the invention may further comprise one or more binders.

The one or more binders may be organic binders, inorganic binders or a combination thereof. Suitable known organic binders include but are not limited to: gums such as, for example, guar gum; modified celluloses and cellulose derivatives such as, for example, methyl cellulose, carboxymethyl cellulose, hydroxypropyl cellulose and hydroxypropyl methylcellulose; wheat flour; starches; sugars; vegetable oils; and combinations thereof.

Suitable known inorganic binders include, but are not limited to: clays such as, for example, bentonite and kaolinite; alumino-silicate derivatives such, for example, as cement, alkali activated alumino-silicates; alkali silicates such as, for example, sodium silicates and potassium silicates; limestone derivatives such as, for example, lime and hydrated lime; alkaline earth compounds and derivatives such as, for example, magnesia cement, magnesium sulfate, calcium sulfate, calcium phosphate and dicalcium phosphate; and aluminium compounds and derivatives such as, for example, aluminium sulphate.

In certain embodiments, layers of multilayer combustible heat sources according to the invention may be formed from a mixture comprising: carbon powder; modified cellulose, such as, for example, carboxymethyl cellulose; flour such as, for example, wheat flour; and sugar such as, for example, white crystalline sugar derived from beet.

In other embodiments, layers of multilayer combustible heat sources according to the invention may be formed from a mixture comprising: carbon powder; modified cellulose, such as, for example, carboxymethyl cellulose; and optionally bentonite.

Instead of, or in addition to one or more binders, layers of multilayer combustible heat sources according to the invention may comprise one or more additives in order to improve the properties of the multilayer combustible heat source. Suitable additives include, but are not limited to, additives to promote consolidation of the multilayer combustible heat source (for example, sintering aids), additives to promote combustion of the multilayer combustible heat source (for example, potassium and potassium salts, such as potassium citrate) and additives to promote decomposition of one or more gases produced by combustion of the multilayer combustible heat source (for example catalysts, such as CuO, Fe_2O_3 and Al_2O_3).

~~Preferably,~~As mentioned above the first layer and the second layer of multilayer combustible heat sources according to the invention are non-fibrous.

compound such as, for example, metal oxide or metal carbonate, that reacts with nitric acid to form a metal nitrate salt. Suitable metal nitrate salt precursors include, but are not limited to calcium carbonate, potassium carbonate, calcium oxide, strontium carbonate, lithium carbonate and dolomite (calcium magnesium carbonate).

Preferably, the concentration of the aqueous solution of nitric acid is between about 20% and about 50% by dry weight, more preferably of between about 30% and about 40% by dry weight. As well as converting the at least one metal nitrate precursor to at least one metal nitrate salt, treatment of carbonaceous multilayer combustible heat sources according to the invention with nitric acid advantageously enhances the porosity of the carbonaceous multilayer combustible heat sources and activates the carbon structure by increasing the surface area thereof.

Smoking articles according to the invention may comprise a non-combustible, substantially air impermeable, barrier between a downstream end of the multilayer combustible heat source and an upstream end of the aerosol-forming substrate.

As used herein, the term 'non-combustible' is used to describe a barrier that is substantially non-combustible at temperatures reached by the multilayer combustible heat source during combustion or ignition thereof.

The barrier may abut one or both of the downstream end of the multilayer combustible heat source and the upstream end of the aerosol-forming substrate.

The barrier may be adhered or otherwise affixed to one or both of the downstream end of the multilayer combustible heat source and the upstream end of the aerosol-forming substrate.

In some embodiments, the barrier comprises a barrier coating provided on a rear face of the multilayer combustible heat source. In such embodiments, preferably the ~~first~~ barrier comprises a barrier coating provided on at least substantially the entire rear face of the multilayer combustible heat source. More preferably, the barrier comprises a barrier coating provided on the entire rear face of the multilayer combustible heat source.

As used herein, the term 'coating' is used to describe a layer of material that covers and is adhered to the multilayer combustible heat source.

The barrier may advantageously limit the temperature to which the aerosol-forming substrate is exposed during ignition or combustion of the multilayer combustible heat source, and so help to avoid or reduce thermal degradation or combustion of the aerosol-forming substrate during use of the smoking article.

Depending upon the desired characteristics and performance of the smoking article, the barrier may have a low thermal conductivity or a high thermal conductivity. In certain embodiments, the barrier may be formed from material having a bulk thermal conductivity of between about 0.1 W per metre Kelvin (W/(m•K)) and about 200 W per metre Kelvin

ingredients that promote the oxidation of carbon monoxide to carbon dioxide, may be incorporated in the barrier. Suitable catalytic ingredients include, but are not limited to, for example, platinum, palladium, transition metals and their oxides.

Where smoking articles according to the invention comprise a barrier between a downstream end of the multilayer combustible heat source and an upstream end of the aerosol-forming substrate and a barrier between the multilayer combustible heat source and one or more airflow channels along the multilayer combustible heat source, the two barriers may be formed from the same or different material or materials.

Where the barrier between the multilayer combustible heat source and the one or more airflow channels comprises a barrier coating provided on an inner surface of the one or more airflow channels, the barrier coating may be applied to the inner surface of the one or more airflow channels by any suitable method, such as the methods described in US-A-5,040,551. For example, the inner surface of the one or more airflow channels may be sprayed, wetted or painted with a solution or a suspension of the barrier coating. In a preferred embodiment, the barrier coating is applied to the inner surface of the one or more airflow channels by the process described in WO-A2-2009/074870 as the multilayer combustible heat source is extruded.

The multilayer combustible heat source and aerosol-forming substrate of smoking articles according to the invention may substantially abut one another. Alternatively, the multilayer combustible heat source and aerosol-forming substrate of smoking articles according to the invention may be longitudinally spaced apart from one another ~~one another~~.

Preferably, smoking articles according to the invention further comprise a heat-conducting element around and in direct contact with a rear portion of the multilayer combustible heat source and an adjacent front portion of the aerosol-forming substrate. The heat-conducting element is preferably combustion resistant and oxygen restricting.

In such embodiments, one or both of the occurrence and visibility of flaming and sparkling associated with the use of certain ignition aids and other additives may be advantageously eliminated or reduced by including such additives in the rear portion of the multilayer combustible heat source surrounded by ~~the first~~ heat-conducting element.

For example, where the combustible first layer is an annular longitudinal outer layer, the second layer is a substantially cylindrical longitudinal inner layer, which is circumscribed by the combustible first layer, and the third layer is a transverse layer, the third layer may be located at the rear of the multilayer combustible heat source and such additives may be included in the third layer.

The heat-conducting element is around and in direct contact with the peripheries of both the rear portion of the multilayer combustible heat source and the front portion of the aerosol-forming substrate. The heat-conducting element provides a thermal link between these two