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GAS GENERATOR COMPOSITION AND MOLDING THEREOF

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GASERZEUGENDE ZUSAMMENSETZUNG UND FORMMASSE DAVON

COMPOSITION SERVANT A GENERER UN GAZ ET SON MOULAGE

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This invention relates to a gas generating composition adequately employed in air bag restraint systems in automobiles and a molded article thereof. More particularly, it relates to a gas generating composition containing fuels comprising a specific polymer compound and an ammonium nitrate-type oxidizing agent as the base together with other additives and a molded article thereof.

Compositions containing sodium azide have been frequently employed as gas generating compositions for air bags to be used in occupant crash protection systems in automobiles. However, there arises in recent years a problem that sodium azide is toxic to the human body and dangerous in handling. Accordingly, attempts have been made to develop gas generating compositions containing various nitrogen-containing organic compounds as so-called non-azide gas generating compositions with improved safety.


Most of these non-azide gas generating compositions consist of fuels comprising nitrogen-containing organic compounds such as metal salts of tetrazole and bitetrazole, triazole or carbohydrazide with oxidizing agents such as potassium nitrate, strontium nitrate or potassium perchlorate.

Moreover, US-A-5,545,272 has disclosed gas generating compositions comprising ammonium nitrate phase-stabilized with 7 to 20% by weight of a potassium salt and nitroguanidine, while WO-A-96/27574 has disclosed gas generating compositions comprising nitroguanidine, phase-stabilized ammonium nitrate and a rubbery binder.

Furthermore, JP-A-7-330477 has disclosed gas generating compositions comprising acrylate-terminated polybutadiene, polybutadiene polycarboxylic acid or epoxy-modified polybutadiene with a hardening agent and an oxidizing agent. JP-A-6-92770 has disclosed gas generating compositions particularly containing an organic binder forming azide groups, an active plasticizer and an oxidizing filler and characterized in that the binder is a product obtained by the reaction between a hydroxylated polyglycidyl azide and at least one polyisocyanate and that ammonium nitrate amounts to at least 85% by weight of the oxidizing filler.

However, these gas generating agents of the azide-type or the non-azide type free from ammonium nitrate are both poor in gas-generation efficiency. For example, the azide-type gas generating agents can generate at most 1.5 mol of gas per 100 g thereof, while the non-azide type ones free from ammonium nitrate can generate at most 2.5 mol of gas per 100 g thereof. In addition, a large amount of residues, which are liquid or solid at high temperatures, are formed during the combustion of these gas generating agents. If such residues are discharged as they are from the inflator, they would damage the air bag, which causes not only a burst of the air bag from the air bag system or combustion of the air bag but also fatal harm to the occupants' breathing.

To minimize the combustion residues discharged from inflators, it is therefore necessary to pack a large amount of filters into the inflators, which interferes downsizing and lightening of the inflators and elevates the production cost thereof.

Although the above-mentioned gas generating compositions comprising phase-stabilized ammonium nitrate and nitroguanidine as described in US-A-5,542,272 and WO-A-96/27574 have higher gas-generation efficiencies and produce less residues, the phase-stabilized ammonium nitrate and nitroguanidine would form together an eutectic at 120°C or below. As a result, it is feared that the gas generating agents may be molten at the welding step in the process of manufacturing inflators. In addition, these compositions containing the phase-stabilized ammonium nitrate and nitroguanidine have high explosive sensitivities, which brings about some problems in qualities and safety during the production of the gas generating agents.

Furthermore, there have been disclosed gas generating agents with the use of energy binders such as azide polymers and ammonium nitrate or phase-stabilized ammonium nitrate which produce few residues (for example, EP-A-705809). However, these gas generating agents would form harmful carbon monoxide in a large amount during combustion. Therefore, it is problematic to simply apply them to gas generating compositions for automotive air bags, though they might be adequate for rocket propellants.

DE-U-9416112 discloses a gas generating composition comprising (A) at least one carbonate, bicarbonate or nitrate of guanidine or a derivative thereof, (B) at least one oxidizing agent selected from alkali metal nitrates, alkaline earth metal nitrates and ammonium nitrate, and (C) at least one carrier selected from silica, alkali metal silicates, alkaline earth metal silicates and aluminosilicates and/or at least one oxygen providing carrier selected from iron oxide, cobalt...
oxide, manganese oxide and copper oxide.

[0012] EP-A-576326 discloses a gas generating composition for an inflator for air bags, said composition comprising an organic binder having azide groups, an energetic plasticizer, and an oxidizing filler containing at least 85 weight % of ammonium nitrate. The organic binder is a reaction product of a polyglycidyl azide containing hydroxy end groups with at least one polyisocyanate.

[0013] EP-A-659712 discloses a gas generating composition for an inflator for air bags, said composition comprising an organic binder being a thermoplastic elastomer, an energetic plasticizer which is a polyglycidyl azide, and an oxidizing agent comprising ammonium nitrate.

Disclosure of Invention

[0014] An object of the present invention is to provide a gas generating composition which is less toxic or dangerous, can be easily handled, has a high combustion efficiency and a high gas-generation efficiency, produces few residues during combustion, can be safely manufactured, and exhibits a high molding strength in the molding step.

[0015] The present inventors have directed their attention to compositions of polymer compounds with ammonium nitrate which produce no or only a practically negligible amount of residues during combustion and have conducted intensive studies on the moldability, combustion properties, safety, practical availability, etc. thereof. As a result, they have found that gas generating compositions containing fuels comprising specific polymer compounds, ammonium nitrate-type oxidizing agents and oxyacid salts, optionally together with a combustion rate regulator such as carbon and a combustion-controlling catalyst such as metal oxides can be practically used solving the above problems. They have thus completed the present invention.

[0016] The present invention provides a gas generating composition comprising:

(a) 3 to 40% by weight of a fuel being a polyacrylamide;
(b) 30 to 94% by weight of an oxidizing agent selected from ammonium nitrate and phase-stabilized ammonium nitrate; and
(c) 0.5 to 20% by weight of at least one combustion accelerator selected from metal nitrates, metal nitrites, perchlorates and chlorates.

[0017] The present invention further provides:

- a molded article of a gas generating composition in the form of a cylinder having a single hole or a cylinder having a plurality of holes obtained by extrusion-molding the above gas generating composition;
- a molded article of a gas generating composition in the form of pellets obtained by compression-molding the above gas generating composition; and
- a molded article of a gas generating composition in the form of a film obtained by molding the above gas generating composition into a film.

[0018] The present invention is also directed to an inflator for air bags which includes the above gas generating composition.

[0019] Preferred embodiments of the invention are set forth in the sub-claims.

[0020] The present invention provides a gas generating composition for air bags to be used as occupant crash protection systems in automobiles and a molded article thereof. The present invention has made it possible to produce a gas generating composition which is less toxic or dangerous, can be easily handled, has a high combustion efficiency and a high gas-generation efficiency and produces few residue during combustion, and a molded articles thereof.

Preferred Embodiment of the Invention

[0021] The polymer compound of the component (a) to be used in the present invention is a polyacrylamide which serves as a fuel and a binder in the gas generating composition. When the oxygen balance, combustion properties, heat stability of the composition compounded with ammonium nitrate, etc. are taken into consideration, generally at least one polymer compound is used as the component of (a). Polyacrylamides are solid at the operating temperatures (-30 to 90°C) of gas generating agents.

[0022] Examples thereof include polyacrylamide and aminated polyacrylamide.

[0023] These polymer compounds are exemplified by those represented by the following general formulae (i) and (ii):

\[(CH₂CHCONH₂)ₙ\]
These polyacrylic polymer compounds are lowly toxic. For example, polyacrylamide shows an acute toxicity $L_{50}$ (oral, mice) of 1,200 mg/kg or above and no mutagenicity. In contrast thereto, the conventionally employed sodium azide shows an acute toxicity $L_{50}$ of 27 mg/kg. Thus, these polyacrylic polymer compounds are apparently much superior in safety in use to sodium azide.

The content of the component (a) in the gas generating composition of the present invention ranges from 3 to 40% by weight, preferably from 5 to 30% by weight.

The oxidizing agent to be used as the component (b) in the gas generating composition of the present invention is ammonium nitrate or phase-stabilized ammonium nitrate. Ammonium nitrate, which has been widely used in fertilizers, explosives, etc., is composed of nitrogen, oxygen and hydrogen and thus forms no solid residue during combustion. In the present invention, use may be made of ammonium nitrate as such as the oxidizing agent. However, it is preferable to use so-called phase-stabilized ammonium nitrate containing a small amount of a potassium salt or other additives, since ammonium nitrate has several phase transition points within the operating temperature range.

The content of the component (b) in the gas generating composition of the present invention ranges from 30 to 94% by weight, preferably from 50 to 85% by weight.

In general, a binary composition consisting of the polymer compound of the above component (a) and the oxidizing agent of the above component (b) shows a low combustion rate and poor combustion properties. However, the combustion rate can be considerably elevated by adding a combustion accelerator which is at least one member selected from metal nitrates, metal nitrites, perchlorates and chlorates as the component (c).

As the combustion accelerator to be used as the component (c), it is preferable to select at least one member from potassium nitrate, sodium nitrate, strontium nitrate, potassium nitrite, sodium nitrite, ammonium perchlorate, sodium perchlorate, potassium perchlorate, sodium chloride and potassium chloride. It is particularly preferable to use therefor potassium nitrate, potassium perchlorate, potassium nitrite or potassium chlorate, since such a compound not only elevates the combustion rate of the binary composition comprising the above components (a) and (b) but also forms phase-stabilized ammonium nitrate together with the ammonium nitrate employed as the component (b) to thereby prevent the gas generating composition from changing in its volume within the operating temperature range.

Although the combustion rate of the gas generating composition can be further elevated by increasing the content of the component (c), the amount of the combustion residues is also increased thereby. Accordingly, the content of the component (c) in the gas generating composition of the present invention ranges from 0.5 to 20% by weight, preferably from 3 to 15% by weight.

In addition to the components (a), (b) and (c) as described above, according to necessity, the gas generating composition of the present invention may further contain a combustion rate regulator selected from carbon and metallic and boron powders as the component (d) to control the combustion rate. As the metallic powder to be employed as the combustion rate regulator of the component (d), use may be made of, for example, at least one member selected from aluminum powder, iron powder and magnesium powder.

It is preferable that the content of the component (d) in the gas generating composition of the present invention is 5% or less by weight.

To further elevate the combustion rate, the gas generating composition of the present invention may also contain a combustion-controlling catalyst selected from metal oxides as the component (e). As the metal oxide powder to be employed as the combustion-controlling catalyst of the component (e), use may be made of, for example, at least one member selected from copper oxide, iron oxide, zinc oxide, cobalt oxide and manganese oxide. It is preferable that the content of the component (e) in the gas generating composition of the present invention is 5% or less by weight.

A particularly preferable example of the gas generating composition of the present invention is one which contains 6 to 16% by weight of polyacrylamide as the component (a), 70 to 85% by weight of ammonium nitrate as the component (b) and 3 to 12% by weight of potassium perchlorate as the component (c).

Compared with the azide-type gas generating agents, the gas generating composition of the present invention has a largely elevated gas generation efficiency per unit weight, forms little combustion residues and ensures downsizing of inflators. A molded article is obtained with the use of the gas generating composition of the present invention by adding to the gas generating composition water or an organic solvent selected depending on the type of the component (a), homogeneously mixing the resultant mixture and extrusion-molding it to give a molded article in the form of a hollow tube having a single through-hole or a tube having a plurality of through-holes. Alternatively, the mixture may be compression-molded by using a tabletting machine, etc. to give a molded article in a shape like a pellet. Alternatively, it may be molded into a film to give a filmy molded article. By processing into such a molded article, the gas generating composition of the present invention can be packed into an inflator.

The gas generating composition of the present invention and molded article thereof are applicable to air bag
inflators at the driver’s seat, air bag inflators at the seat next to the driver and side inflators. They are also applicable
to hybrid inflators. Thus, it is unnecessary to provide an air bag inflator at the driver’s seat with any filter for filtering
residues, since the gas generating composition of the present invention and its molded article have a high gas-gener-
ation efficiency and produce few residue. Therefore, it will suffice when the inflator is merely packed with such a small
amount of a coolant as to prevent the combustion flame from escaping out. By using the gas generating composition
and its molded article according to the present invention, therefore, the volume, outer diameter and height of the com-
bustion chamber can be reduced respectively to 40 cm$^3$ or less, 60 mm or less and 40 mm or less. In the case of a
hybrid inflator, an oxygen-free compressed gas may be employed, since the gas generating composition and its molded
article of the present invention has no or almost no oxygen balance.

Embodiments

To further illustrate the present invention in greater detail, the following Examples will be given.

In the following Tables 1 to 5, PAA stands for polyacrylamide, PAH stands for aminated polyacrylamide. AN
stands for ammonium nitrate, KClO$_4$ stands for potassium perchlorate, KNO$_3$ stands for potassium nitrate, C stands
for carbon, CuO stands for copper oxide, NQ stands for nitroguanidine and PSAN stands for phase-stabilized ammo-
nium nitrate (AN/KClO$_4$ = 90/10).

Examples 1 to 5 and Comparative Examples 1 and 2

Gas generating compositions as listed in Table 1 were prepared. Table 1 also shows the theoretically calcu-
lated combustion temperature, gas-generation efficiency [the amount (mol) of gas generated from 100 g of the com-
position] and the amount of the residues produced [the amount (g) of solid residues produced with the generation of
1 mol of gas at ordinary temperature] of each composition.

| Ex. 1 | PAA/AN/KClO$_4$ | 12/83/5 | 2308 | 4.04 | 0.68 |
| Ex. 2 | PAH/AN/KClO$_4$ | 12/81/7 | 2300 | 4.02 | 0.93 |
| Ex. 3 | PAA/AN/KNO$_3$ | 11/82/7 | 2240 | 4.02 | 1.24 |
| Ex. 4 | PAA/AN/KClO$_4$/C | 7/83/7/3 | 2354 | 3.96 | 0.98 |
| Ex. 5 | PAA/AN/KClO$_4$ /CuO | 11/82/7/0.5 | 2306 | 4.01 | 1.06 |
| Comp. Ex. 1 | sodium azide/CuO | 69/31 | 1374 | 1.59 | 35.14 |
| Comp. Ex. 2 | 5-amino-tetrazole/ KNO$_3$ | 41/59 | 2115 | 2.40 | 16.33 |

Examples 6 to 10

Gas generating compositions as listed in Table 2 were prepared and the friction sensitivity and drop hammer
sensitivity of each composition were measured in accordance with the Testing Methods of Explosives as stipulated in
Japanese Industrial Standards (JIS: K4810-1979). Table 2 summarizes the results.

| Ex. 6 | PAA/AN/KClO$_4$ | 12/83/5 | > 36.0 | 30 - 40 |
| Ex. 7 | PAA/AN/KNO$_3$ | 11/82/7 | > 36.0 | 30 - 40 |
| Ex. 8 | PAA/AN/KClO$_4$/C | 7/83/7/3 | > 36.0 | 50 - 60 |
| Ex. 9 | PAA/AN/KClO$_4$/CuO | 12/83/5/0.5 | > 36.0 | 40 - 50 |
Examples 11 to 13 and Comparative Example 3

[0041] Gas generating compositions as listed in Table 3 were prepared and the melting point, heat buildup starting temperature and TG weight loss starting temperature of each composition were measured by using a differential thermal analyzer (Model TAS-200, mfd. by Rigaku K.K.). The measurement was effected at a temperature rise rate of 20°C/min in a nitrogen gas atmosphere with the use of 1 to 3 mg of samples. Table 3 summarizes the results.

<table>
<thead>
<tr>
<th>Ex. 11</th>
<th>PAH/AN/KClO₄</th>
<th>12/81/7/0.5</th>
<th>&gt; 36.0</th>
<th>&gt; 100</th>
</tr>
</thead>
</table>

Table 3

Examples 14 to 18

[0042] Gas generating compositions as listed in Table 4 were prepared and molded into strands. Then the combustion rate of each composition was measured under a pressure of 70 kg/cm² in a nitrogen atmosphere. Table 4 summarizes the results.

<table>
<thead>
<tr>
<th>Ex. 14</th>
<th>PAH/AN/KClO₄</th>
<th>12/81/7</th>
<th>7.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex. 15</td>
<td>PAH/AN/KClO₄</td>
<td>12/81/7</td>
<td>6.0</td>
</tr>
<tr>
<td>Ex. 16</td>
<td>PAH/AN/KNO₃</td>
<td>12/79/9</td>
<td>6.6</td>
</tr>
<tr>
<td>Ex. 17</td>
<td>PAH/AN/KNO₃</td>
<td>12/79/9</td>
<td>6.4</td>
</tr>
<tr>
<td>Ex. 18</td>
<td>PAH/AN/KClO₄/CuO</td>
<td>12/81/7/0.5</td>
<td>7.1</td>
</tr>
</tbody>
</table>

Examples 19 to 21 and Comparative Example 4

[0043] Gas generating compositions as listed in Table 5 were prepared and subjected to an initiation sensitivity test to confirm the safety thereof during production. The initiation sensitivity test was effected by packing each composition in a polyvinyl chloride tube (outer diameter: 30 mm, inner diameter: 25 mm, length: 200 mm) and closing the tube at one end thereof with a rubber stopper. Then a No. 6 instantaneous electric detonator was inserted into the tube from the other end thereof. Next, the tube was buried in sand (at a depth of 200 mm) and then exploded. After the completion of the test, the initiation sensitivity of each composition was evaluated based on the size of the crater thus formed and the residues. Table 5 summarizes the results.

<table>
<thead>
<tr>
<th>Ex. 19</th>
<th>PAH/AN/KClO₄</th>
<th>12/81/7</th>
<th>no</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex. 20</td>
<td>PAH/AN/KClO₄</td>
<td>12/81/7</td>
<td>no</td>
</tr>
</tbody>
</table>
Example 22

[0044] 65 g of water was added to 120 g of powdery polyacrylamide, 810 g of powdery ammonium nitrate and 70 g of powdery potassium perchlorate. After homogeneous mixing, the resultant mixture was extrusion molded into an extruded powder of 2.5 mm in outer diameter, 0.8 mm in inner diameter and 2 mm in length. After drying at 80°C for 72 hours, 25.4 g of the extruded powder was filled into an inflator and subjected to a combustion test in a 60 ℓ tank. Thus the tank pressure reached 2.2 kgf/cm² 51 ms after the initiation of the combustion. After the completion of the combustion, the gas generating agent in the tank was analyzed to find out that none of the components exceeded the permissible level.

Claims

1. A gas generating composition comprising:
   (a) 3 to 40% by weight of a fuel being a polyacrylamide;
   (b) 30 to 94% by weight of an oxidizing agent selected from ammonium nitrate and phase-stabilized ammonium nitrate; and
   (c) 0.5 to 20% by weight of at least one combustion accelerator selected from metal nitrates, metal nitrites, perchlorates and chlorates.

2. A gas generating composition according to Claim 1, which further comprises one or more members selected from the group consisting of:
   (d) combustion rate regulators selected from carbon and metallic and boron powders; and
   (e) combustion-controlling catalysts selected from metal oxides.

3. A gas generating composition according to Claim 2, which comprises at most 5% by weight of the component (d) and at most 5% by weight of the component (e).

4. A gas generating composition according to Claim 1 or 2, wherein said combustion accelerator as the component (c) is at least one member selected from potassium nitrate, sodium nitrate, strontium nitrate, potassium nitrite, sodium nitrite, ammonium perchlorate, sodium perchlorate, potassium perchlorate, sodium chlorate and potassium perchlorate.

5. A gas generating composition according to Claim 2 or 3, wherein said combustion-controlling catalyst as the component (e) is at least one member selected from copper oxide, iron oxide, zinc oxide, cobalt oxide and manganese oxide.

6. A gas generating composition according to Claim 1, which comprises 6 to 16% by weight of polyacrylamide as the component (a), 70 to 85% by weight of ammonium nitrate as the component (b) and 3 to 12% by weight of potassium perchlorate as the component (c).

7. A molded article of a gas generating composition in the form of a cylinder having a single hole or a cylinder having a plurality of holes obtained by extrusion-molding a gas generating composition according to Claim 1 or 2.

8. A molded article of a gas generating composition in the form of pellets obtained by compression-molding a gas generating composition according to Claim 1 or 2.
9. A molded article of a gas generating composition in the form of a film obtained by molding a gas generating composition according to Claim 1 or 2 into a film.

10. An inflator for air bags which includes a gas generating composition according to Claim 1 or 2.

**Patentansprüche**

1. Gaserzeugende Zusammensetzung, umfassend:
   (a) 3 bis 40 Gew.% eines Polyacrylamids, das als Brennstoff verwendet wird;
   (b) 30 bis 94 Gew.% eines Oxidationsmittels, ausgewählt aus Ammoniumnitrat und phasenstabilisiertem Ammoniumnitrat; und
   (c) 0,5 bis 20 Gew.% mindestens eines Verbrennungsbeschleunigers, ausgewählt aus Metallnitriten, Metallnitriten, Perchloraten und Chloraten.

2. Gaserzeugende Zusammensetzung nach Anspruch 1, weiterhin umfassend einen oder mehrere Bestandteile, ausgewählt aus der Gruppe, bestehend aus:
   (d) Mitteln zum Einstellen der Verbrennungsgeschwindigkeit, ausgewählt aus Kohlenstoff, Metallpulvern und Borpulver; und
   (e) Katalysatoren, die die Verbrennung steuern, ausgewählt aus Metalloxiden.


4. Gaserzeugende Zusammensetzung nach Anspruch 1 oder 2, wobei der Verbrennungsbeschleuniger, der als Bestandteil (c) verwendet wird, mindestens einen Bestandteil umfasst, ausgewählt aus Kaliumnitrat, Natriumnitrat, Strontiumnitrat, Kaliumnitrit, Natriumnitrit, Ammoniumperchlorat, Natriumperchlorat, Kaliumperchlorat, Natriumchlorat und Kaliumchlorat.

5. Gaserzeugende Zusammensetzung nach Anspruch 2 oder 3, wobei der Katalysator, der die Verbrennung steuert und der als Bestandteil (e) verwendet wird, mindestens einen Bestandteil umfasst, ausgewählt aus Kuperoxid, Eisenoxyd, Zinkoxyd, Cobaltoxid und Manganoxid.

6. Gaserzeugende Zusammensetzung nach Anspruch 1, umfassend 6 bis 16 Gew.% eines Polyacrylamids, das als Bestandteil (a) verwendet wird, 70 bis 85 Gew.% Ammoniumnitrat, das als Bestandteil (b) verwendet wird, und 3 bis 12 Gew.% Kaliumperchlorat, das als Bestandteil (c) verwendet wird.

7. Formkörper aus einer gaserzeugenden Zusammensetzung in Form eines Zylinders mit einem einzigen durchgehenden Loch oder eines Zylinders mit einer Vielzahl von durchgehenden Löchern, erhalten durch Extrudieren der gaserzeugenden Zusammensetzung nach Anspruch 1 oder 2.

8. Formkörper aus einer gaserzeugenden Zusammensetzung in Form von Pellets, erhalten durch Formpressen der gaserzeugenden Zusammensetzung nach Anspruch 1 oder 2.

9. Formkörper aus einer gaserzeugenden Zusammensetzung in Form eines Films, erhalten durch Formen der gaserzeugenden Zusammensetzung nach Anspruch 1 oder 2 zu einem Film.

10. Aufblasvorrichtung für einen Airbag, umfassend die gaserzeugende Zusammensetzung nach Anspruch 1 oder 2.

**Revendications**

1. Composition génératrice de gaz, comprenant :
   (a) de 3 à 40 % en poids d’un combustible étant un polyacrylamine ;
   (b) de 30 à 94 % en poids d’un agent oxydant choisi parmi le nitrate d’ammonium et le nitrate d’ammonium
en phase stabilisée ; et
c) de 0,5 à 20 % en poids d'au moins un accélérateur de combustion choisi parmi les nitrates de métal, les nitrites de métal, les perchlorates et les chlorates.

2. Composition génératrice de gaz selon la revendication 1, comprenant en outre un ou plusieurs éléments choisis parmi le groupe consistant en :
   (d) les régulateurs de vitesse de combustion choisis parmi les poudres de carbone, de métal et de bore ; et
   (e) les catalyseurs régulateurs de combustion choisis parmi les oxydes de métal.

3. Composition génératrice de gaz selon la revendication 2, qui comprend au plus 5 % en poids du composant (d) et au plus 5 % en poids du composant (e).

4. Composition génératrice de gaz selon la revendication 1 ou 2, dans laquelle ledit accélérateur de combustion en tant que composant (c), comprend au moins un élément choisi parmi le nitrate de potassium, le nitrate de sodium, le nitrate de strontium, le nitrite de potassium, le nitrite de sodium, le perchlorate d'ammonium, le perchlorate de sodium, le perchlorate de potassium, le chlorate de sodium et le chlorate de potassium.

5. Composition génératrice de gaz selon la revendication 2 ou 3, dans laquelle ledit catalyseur régulateur de combustion en tant que composant (e), comprend au moins un composant choisi parmi l'oxyde de cuivre, l'oxyde de fer, l'oxyde de zinc, l'oxyde de cobalt et l'oxyde de manganèse.

6. Composition génératrice de gaz selon la revendication 1, qui comprend de 6 à 16 % en poids de polyacrylamide en tant que composant (a), de 70 à 85 % en poids de nitrate d'ammonium en tant que composant (b) et de 3 à 12 % en poids de perchlorate de potassium en tant que composant (c).

7. Article moulé d'une composition génératrice de gaz, sous la forme d'un cylindre comportant un seul trou, ou d'un cylindre comportant plusieurs trous, obtenu par moulage avec extrusion d'une composition génératrice de gaz selon la revendication 1 ou 2.

8. Article moulé d'une composition génératrice de gaz sous la forme de granulés obtenus par moulage avec compression d'une composition génératrice de gaz selon la revendication 1 ou 2.

9. Article moulé d'une composition génératrice de gaz sous la forme d'un film, obtenu par moulage d'une composition génératrice de gaz selon la revendication 1 ou 2, en un film.

10. Gonfleur pour sacs pneumatiques, comprenant une composition génératrice de gaz selon la revendication 1 ou 2.