1. Introduction

This paper is concerned with airbag compositions based on organic nitrogen compounds, tetrazole, aminotetrazole, nitrotetrazole, nitroaminotetrazole and triazole as fuel. The paper describes general problems of airbags, like stability over the lifetime of the car and yet a very quick gas generation when needed. It is described that airbags generally contain a fuel and an inorganic oxidant.

The paper specifically mentions the problem of metal oxides formed from the oxidant during the reactions in the airbag. These metal oxides are harmful for the environment and can be harmful for the human body. The paper describes that the addition of carbides or nitrides to the airbag composition helps to convert the oxides into substances having a higher melting point, which makes them easier to separate (in the solid phase) from the airbag at the high operating temperatures of the airbag. These substances that are easily removed are called slag. A further advantage of using these carbides and nitrides is that their decomposition gives rise to the generation of additional gases, which is good for the overall performance of the airbag.

The paper also describes several preferred embodiments. In order to get even better slag formation, the addition of metal oxides or hydroxides of titanium and aluminium as a secondary slag forming agent is described. Only for the carbides it is disclosed that hydrotalcite is very useful as a secondary slag forming agent. In addition to improving the slag formation, the hydrotalcite also absorbs some of the (noxious) gases produced in the airbag and renders the composition more stable.

The composition is formed into pellets for use in the airbag. In order to help the formation of the pellets the composition can contain a water-soluble polymer and a lubricant.

The claims of the application are directed to the general composition of fuel, oxidant and carbide or nitride. Dependent claims are directed to compositions with the secondary slag forming agents.

Two prior art documents are cited by the examiner. The communication raises novelty objections from both documents.

Document 1 is also concerned with an airbag composition having a fuel (tetrazoles and triazoles), oxidant and a carbide or nitride as slag forming agents. The document discloses a process to make the airbag compositions, which is identical to that of the application. This document generally mentions that clays can be used as secondary slag forming agent.
Document 2 is not concerned with airbags but with explosives for the demolition of buildings. This document discloses a composition falling within claims 1 to 4. The document describes that it is necessary that the fuel has a particle size in the order of 1 mm in order to achieve powerful explosions. The composition reacts in 3 seconds. These two features make the explosives of D2 unsuitable for an airbag. See in this respect D1, which discloses that 50 ms reaction time is essential for an airbag (paragraph [007]).

The communication also raises an objection under Article 84 EPC. An essential feature is lacking from claim 1. From the description it is clear that the particle size of the fuel components is an essential feature of the invention. This feature is not contained in claim 1.

The paper contains a letter with instructions from the client for the patent attorney. A set of claims is proposed by the client in an annex of this letter.

The client limits the claims to an embodiment using a secondary slag forming agent in the form of hydrotalcite. In addition, the ratio with respect to the primary slag forming agent is defined in proposed claim 1. The client maintains nitride in the proposed claim, apparently believing there is sufficient basis for the combination of nitride and hydrotalcite.

The candidates are supposed to realise that under Article 123(2) EPC there is no basis for the proposed claim, because the application only discloses the combination of hydrotalcite with carbide but never with nitride (see paragraph [011]; example 4; claim 3).

Dependent claim 2 is maintained by the client in his proposal. There is no basis for the subject-matter arising from the combination of new claim 1 with this dependent claim, since the combination of titanium and aluminium oxides/hydroxides with hydrotalcite is not disclosed in the application. The candidates should realise that this claim has to be deleted.

The client does not add the particle size of the fuel to claim 1, arguing that it is not necessary to obtain a patentable claim. The candidates should realise that this objection under Article 84 EPC can only be overcome by introducing the particle sizes in claim 1.

In contrast, the client adds the ratio of carbide to hydrotalcite to claim 1 as according to him this is essential (see paragraph [016]) and mentions that these are the only compositions that work.

Process claim 3 is amended to include two features, the one that defines the pressing time for the pellets to be more than 5 minutes and the one that defines that the slag forming agents need to be mixed first. Claim 3 is, like claim 1, directed to both the nitride and the carbide. Therefore, the nitride needs to be deleted from claim 3.
Finally the client states that he cannot be contacted for further instruction. It is, therefore, not expected that candidates write letters to the client with their answer.

2. Claims (30 marks)

The following set of claims is expected:

1. Airbag composition comprising,
   (i) 20 to 50 wt.% of a fuel being selected from the group of tetrazole, aminotetrazole, nitrotetrazole, nitroaminotetrazole and triazole, the fuel components having a particle size of 5 to 80 \( \mu \text{m} \);
   (ii) 30 to 70 wt.% of an oxidant being selected from alkali metal or alkaline earth metal nitrate, chlorate or perchlorate;
   (iii) 10 to 20 wt.% of a slag forming agent comprising a carbide or nitride of boron, aluminium or silicon and hydrotalcite as a secondary slag forming agent, the hydrotalcite being present in a weight ratio of 1:5 to 5:1 with respect to the carbide.

2. Airbag composition according to claim 1 in which the slag forming agent comprises a secondary slag forming agent selected from oxides or hydroxides of titanium or aluminium.

3. Airbag composition according to claim 1 in which the composition comprises carbides as slag forming agent hydrotalcite as a secondary slag forming agent.

4. Airbag composition according to either claim 2 or 3 in which the secondary slag forming agent is added in a weight ratio of 1:5 to 5:1 with respect to the nitride or carbide.

2. Process for making the airbag composition according to any of claims 1 to 4 comprising the steps:
   (i) mixing the carbide slag forming agent with the hydrotalcite the ingredients;
   (ii) mixing the mixture of step (i) with the remaining ingredients
   (iii) pressing the mixture into pellets, whereby the pressing takes at least 5 minutes;
   (iii) heat treating the pellets at a temperature between 80 and 120°C for at least 10 hours.

3. Airbag comprising the airbag composition according to any one of claims 1 to 4.

Claim 1 as proposed in the client’s letter contravenes Article 123(2) EPC as there is no basis for the combination of the nitrides with hydrotalcite. The nitrides need to be deleted from claim 1. Furthermore, the particle size of the fuel needs to be introduced into claim 1. Finally, the weight ratio of carbide to hydrotalcite is indeed essential and needs to be maintained in claim 1. 15 Marks are available for this claim. 7 marks are deducted if the nitrides were not deleted from claim 1. 8 marks are deducted if the particle size of the fuel is not introduced and 3 when the weight ratio of carbide to hydrotalcite was removed.
Unnecessary limitations led to a deduction of 5 marks. Claims that are not novel did not receive any marks.

Claim 2 needs to be deleted from the set of claims proposed by the client since there was no basis for the combination of those claims with new claim 1. Deleting this claim was worth 3 marks.

Claim 3 had to be amended to remove the nitride from the claim, for the same reasons as with claim 1. This claim was worth 10 marks. If it was not specified that the carbide and hydrotalcite need to be mixed first, 5 marks were lost. 5 marks were also lost if the pressing time of at least 5 minutes was not defined. If the nitride was not deleted 2 marks were lost, but only if this had been done in claim 1. No double deductions were made. Unnecessary limitations led to a deduction of 5 marks. Claims that are not novel did not receive any marks.

Claim 4 had to be maintained as proposed by the client, as long as the dependency was amended. 2 marks were available if this was done correctly.

3. Argumentation

**Article 123(2) EPC (15 marks)**

The argumentation for Article 123(2) EPC for claim 1 is straightforward. Claim 1 is a combination of claims 1, 3 and 4 as originally filed. Further basis can be found in paragraph [011]. Claim 1 has also been amended by inclusion of the particle size of the fuel. The basis for this amendment can be found in paragraph [014]. Also the ratio of hydrotalcite to carbide was added. This is based on paragraph [016]. 8 marks are available for arguing this properly. Since these features are disclosed in general and not in combination with other features, they can be combined.

The process claim has been amended by including the feature that the slag ingredients are mixed first. This amendment is based on paragraphs [017] and [018]. Furthermore, it has been specified that the pressing of the pellets should take at least 5 minutes. This can be derived from paragraph [018]. It should further be argued that the combination of these two features is disclosed. 7 marks are available for this argumentation.

If the candidate does not remove the nitrides from the claims a maximum of 8 marks is available for the argumentation of Article 123(2) EPC.

If the candidate does not remove dependent claim 2 from the set of claims, 5 marks less are available for the argumentation of Article 123(2) EPC.

If the candidate adds further claims, half of the marks are reserved for the arguments regarding these claims.
4. **Clarity (5 marks)**

5 marks are available for argumentation that the claims now contain all essential features as required by Article 84 EPC. Candidates who decide not to include the particle size in claim 1 cannot earn any marks for Article 84 EPC.

Candidates who add unclear claims lose marks for clarity.

5. **Novelty and inventive step**

Sometimes, candidates draft very narrow independent claims. Such claims are much easier to argue for novelty and inventive step. Such claims can only attract a maximum of 25 marks for the argumentation for novelty and inventive step. They often go against the client’s wishes.

In cases where candidates add new independent claims, half of the marks are reserved for the arguments for novelty and inventive step for these claims.

6. **Novelty (15 marks)**

Document 1 discloses an airbag composition comprising fuel, oxidant and nitride or carbide as slag forming agent. The fuel can be from the tetrazole and triazole family.

Although D1 generally refers to clays, it does not disclose the presence of hydrotalcite in the composition. It should be argued that the hydrotalcite is a specific form of clay which is not mentioned in D1. Claim 1 is thus novel over document 1. 8 marks are available for discussing the content of D1 and identifying the novel features.

In view of document D2 it should be argued that the document does not disclose the particle size of the fuel. In D2 the particles are much larger, namely larger than 1 mm. 7 marks are available for discussing the content of D2 and identifying the novel feature.

7. **Inventive step (35 marks)**

Document 1 is considered closest prior art for claim 1. This document is also concerned with airbag compositions and is, therefore, a good springboard for the person skilled in the art. Document 2 cannot be the closest prior art, because, even though the composition disclosed in this document is very similar to that of the claims, the composition disclosed in that document is not suitable for airbags. 5 marks are available for arguing D1 to be the choice of closest prior art. Merely stating that D1 is the closest prior art cannot earn full marks.

The difference between the subject-matter of claim 1 and document 1 lies in the fact that in claim 1 the composition additionally contains hydrotalcite as a secondary slag forming agent.
The use of hydrotalcite has three technical effects. Firstly, the percentage of recovered slag is higher than for any of the other compositions disclosed. This is clear from table 1, example 4. This thus results in less harm for the environment or even humans (see paragraph [005]).

Secondly, the presence of hydrotalcite has an influence on the amount of noxious gases exhausted from the airbag. This can be seen from table 2, the same example as mentioned before.

Thirdly, the information of paragraphs [002] and [022] shows that the composition is more stable.

Not all technical effects need to be identified, but the ones identified need to be properly argued. Especially the effect on the recovery of slag is not very large in the examples. Mere mention of this technical effect on its own, therefore, cannot attract full marks.

5 marks are available for identifying the technical effect

In view of the technical effects, the objective technical problem can be defined as the provision of a more stable airbag composition with low environmental burden. Also 5 marks are available for identifying the correct problem.

10 marks in total are thus available for identifying technical effect and problem.

Demonstrating that the problem is actually solved should be done by making reference to the examples. Arguing this properly is worth 10 marks. For arguing that the claimed subject-matter involves an inventive step reference should be made to both D1 and D2. For D1 it should be argued that there is no indication that hydrotalcite could be used in the airbag composition that is described in that document. D2 does disclose that hydrotalcite can be used in an explosive composition. However, the combination of the teachings of D1 and D2 would lead to big pellets having a slow reaction time. It is clear that such compositions are not included in the scope of the claims and are not suitable for an airbag. The person skilled in the art would, therefore, also not think of using hydrotalcite to solve the above-identified problem without the exercise of inventive skills. 10 marks are available for arguing this convincingly.

A perfect answer must also include arguments as to why the problem is solved over the whole range claimed.
8. Miscellaneous

Candidates who decide to include a new independent claim are expected to provide complete arguments for such a claim. Up to half of the marks for arguments were reserved for such claim if present. As Paper B is an amendment paper, the drafting of new independent and/or dependent claims is usually not considered as time well spent if not specifically requested by the client in his letter.