

## Examiners' Report Paper A 2009 (Chemistry)

### Introduction

Paper A was concerned with the artificial formation of a green patina on copper, bronze or brass articles in particular copper roofing panels. The letter from the client described a process for forming the patina and solutions suitable for use in the process.

The client's letter identified the characteristics of a good process for forming a patina, namely the process must be sufficiently fast, produce a patina with a colour that matches the natural patina and adheres well to the metal surface.

The first prior art document (document 1) cited by the client concerned a process for forming an artificial patina in which the patina formation was fast and had a colour which closely matched that of a natural patina. The patina was formed using a process involving cleaning and rinsing the metal surface and applying a solution with a pH of 8-10 containing ammonia, ammonium sulphate, ammonium chloride and copper sulphate with at least 40g/l sulphate and 1 g/l chloride ions. The treated surface was aged under atmospheric conditions to allow the patina to develop. The patina formed was stated to adhere poorly to the metal surface.

The second prior art document (document 2) cited by the client detailed the investigation of a natural patina. The document shows that a patina is mainly a mixture of basic copper sulphates and basic copper chlorides. The document explained that a patina is formed due to the action of rainwater on the metal surface and showed that rainwater is a very dilute acidic solution notably containing sulphate and chloride ions. The document also disclosed forming an artificial patina using a solution with a pH of 5 containing 100g/l sulphate ions, 15 g/l chloride ions, 5 g/l copper ions, 5 g/l zinc ions and 10 g/l arsenic trioxide. This treated panel was cured in an oven at 50°C for 48 hours.

The candidates were expected to recognise that document 1 is the closest prior art and that the objective problem in view of this document is to improve the adhesion of the patina whilst maintaining the other desirable features of the known processes. Candidates were expected to file claims reflecting this problem.

**Independent claims:**

A total of **70 marks** were available for independent claims.

**Process claim:**

Candidates were expected to file the following independent process claim for which a maximum of **40 marks** could be awarded:

A process for patinating copper, bronze or brass articles comprising the steps:

- a) cleaning the metal surface
- b) rinsing the cleaned surface
- c) contacting the surface with an aqueous patinating solution containing at least 40 g/l sulphate ions and at least 1 g/l chloride ions and having a pH of 8-10 or having a pH of 3-6 and also containing arsenic trioxide
- d) aging the treated article surface by heating it to a temperature of 65-95°C for at least 7 hours in an atmosphere having a relative humidity of at least 75%

The candidates were expected to realise that the process could be applied to form a patina on any copper, bronze or brass article (copper or copper alloy was also accepted). Limiting the process to copper articles led to a deduction of 10 marks, if the process was restricted to copper roofing panels 15 marks were deducted. If it was not stated which metal was treated 10 marks were deducted.

Cleaning is essential for forming a good quality treatment as stated in the client's letter and had to be claimed. It was acceptable to claim a process involving just cleaning, a process involving cleaning and rinsing with water or the use of a clean surface. A failure to specifying cleaning led to a deduction of 10 marks.

The client's letter described two possible classes of solutions suitable for forming the patina an acidic solution (pH 3-6) and a basic solution (pH 8-10). The client however explained in example 3 that the acidic solution since it must contain arsenic was too toxic to be of any commercial use. This did not however mean that the acidic solutions needed to be disregarded when formulating the claims since the commercial problems could later be resolved. 5 marks were deducted from candidates who did not claim the acidic solutions. 3 marks were also deducted per essential feature of the solutions missing from the claim (this resulted in a total deduction of 12 marks if the composition of the patinating solution was not defined in the claim).

It was possible when formulating the process claim to use the broadest definitions of both the acidic and the basic solutions disclosed in the letter. The letter indicated that the effects of the invention are obtained with any of the solutions disclosed. It was in particular not necessary to specify the preferred concentrations of the components present or that zinc ions or a wetting agent were present. Each additional limitation to the solution resulted in a deduction of 3 marks.

The letter and in particular the examples made it clear that the conditions used during the aging step are crucial for solving the problem addressed by the invention and in particular the good adhesion of the patina. Candidates were expected to recognise that a minimum time period, a temperature range and a minimum relative humidity are essential. In addition the relative terms high temperature and high relative humidity used in the letter implied no clear limitations and did not provide an appropriate definition of these parameters. In order to define the temperature, treatment time and relative humidity the table in example 2 should have been used. This table contains examples with satisfactory adhesion (rating of 7 or above) when the relative humidity is 80%, the temperature is 70-90°C and the treatment time is at least 8 hours. The best solution was to choose values for temperature, relative humidity and time between these values and the values shown not to work in the examples and thus the best option was to claim a temperature of 65-95°C a time of at least 7 hours and an atmosphere having a relative humidity of at least 75%. However as long as the values covered all the good examples and excluded all bad examples they were accepted. Thus for the temperature a range of above 60°C to below 100°C was accepted as well as a range of 70-90°C. A relative humidity of above 70% or at least 80% was acceptable and a time of more than 6 hours or at least 8 hours was accepted. Each limitation missing from the aging step could lose 5 marks. Adding an upper limit for the time results in a deduction of 2 marks.

A further 5 marks could be lost if the claim provided was unclear.

### **Claim to a patinating solution:**

The candidates were also expected to file an independent claim to a patinating solution. This claim could gain a maximum of 10 marks and was expected to have the following wording:

Patinating solution having a pH of 8-10 containing at least 40 g/l sulphate ions, at least 1g/l chloride ions, zinc ions and copper ions.

The solution had to be basic since the acidic solutions used in the application are disclosed in document 2. The definition of the basic solution used in the process claim could not be used since such a solution was not novel in view of the solution disclosed in document 1. It was in addition not possible to render the solution novel by specifying that it contained copper ions since this is known from document 1. The presence of a wetting agent would render the claim novel, but this was not inventive in view of the document 1 and the skilled person's general knowledge (as admitted in the client's letter). The broadest scope of protection for the solution was obtained by specifying that it contains copper and zinc ions. It was not necessary to specify the concentrations in the solution since these are only preferred.

Any claim to a patinating solution which was acidic or not novel gained no marks. A patinating solution rendered novel by the presence of a wetting agent was also awarded no marks. The presence of preferred ranges for concentrations of copper and or zinc resulted in a deduction of 2 marks per concentration. There was also no support for claiming solutions which contained zinc but no copper ions, this resulted in a deduction of 5 marks.

**Product by process claim:**

The candidates were also expected to realise that the copper, brass or bronze articles coated with the patina layer of the invention could be claimed. The client's letter demonstrated that the patina layer obtained by the process was different from the natural layers known from document 2 and the artificial layers known from documents 1 and 2. The letter, however, provided no clear definition of features which could be used to unambiguously identify the patina. It was therefore necessary to claim the articles as a product by process claim. This claim was awarded up to **20 marks** and could be worded as follows:

Patinated copper, brass or bronze article obtainable by the claimed process.

5 marks were lost if roof tiles were claimed, a further 5 marks were deducted if the claim either did not cover each of copper, brass and bronze or was limited to copper. Claiming the patina without requiring the metal to be present was considered to be unclear and lost 5 marks.

**General points:**

A number of candidates lost a significant number of marks by filing claims of an extremely limited scope (for example restricting the humidity in the process claims to a value of exactly 80 %). Candidates are always advised to consider if the wording they are proposing amounts to a useful claim. It is always possible in Paper A to use wording which is not contained in the paper.

Candidates also frequently lost marks because they did not appreciate that the definition of the patinating solution could be different in the process claim and the claim to the solution as such. Candidates are advised to consider the scope of each independent claim separately.

As usual candidates who filed multiple independent claims, which did not fulfil the requirements of Rule 43(2) EPC or filed clearly invalid claims lost marks.

**Dependent claims:**

A total of **15 marks** are available for the dependent claims.

5 of these marks were reserved for claiming an article obtainable by the process which is a copper roofing panel.

The other 10 marks (up to 2 marks per claim) were awarded for appropriate dependent claims, these could include: A process where the solution contains copper ions. A process where the solution contains copper ions and zinc ions. A process in which the heating is performed for 8-24 hours. A solution where the solution contains 60-120 g/l sulphate ions, 10-30 g/l chloride ions, 2-10 g/l copper ions, and 2-10 g/l zinc ions. A solution where the solution consists of water, 100g/l sulphate ions, 20g/l chloride ions, 5 g/l copper ions, 5 g/l zinc ions, sufficient ammonia to adjust the pH to 8-10 and 1g/l of a wetting agent.

**Description:**

A total of **15 marks** were available for the description of these up to 5 marks could be awarded for correctly formulating the problem, a further 5 marks were available for discussing the prior art cited, the remaining marks were awarded to candidates who ensured that the description was consistent with the claims, supported them and was no longer formulated like a letter. The description should be formulated as specified in Rule 42 EPC. It is inappropriate to formulate the description as if it were a response to an official communication from the European Patent Office.

**Model Claims:**

The expected claims could thus be worded as follows:

1. A process for patinating copper, bronze or brass articles comprising the steps:  
cleaning the metal surface  
rinsing the cleaned surface  
contacting the surface with an aqueous patinating solution containing at least 40 g/l sulphate ions and at least 1 g/l chloride ions and having a pH of 8-10 or having a pH of 3-6 and also containing arsenic trioxide  
aging the treated article surface by heating it to a temperature of 65-95°C for at least 7 hours in an atmosphere having a relative humidity of at least 75%.
2. A process according to claim 1 in which the patinating solution contains copper ions.
3. A process according to claim 1 in which the patinating solution contains copper and zinc ions.
4. A process according to claim 1 where the heating is performed for 8-24 hours.
5. Patinating solution having a pH of 8-10 containing at least 40 g/l sulphate ions, at least 1g/l chloride ions, zinc ions and copper ions.
6. Patinating solution according to claim 5 containing 60-120 g/l sulphate ions, 10-30 g/l chloride ions, 2-10 g/l copper ions, and 2-10 g/l zinc ions.
7. Patinating solution according to claim 6 consisting of water, 100g/l sulphate ions, 20g/l chloride ions, 5 g/l copper ions, 5 g/l zinc ions, sufficient ammonia to adjust the pH to 8-10 and 1g/l of a wetting agent.
8. A process according to claim 1 where the patinating solution is as specified in any one of the claims 5-7.
9. Patinated copper, brass or bronze article obtainable by the process of any one of claims 1-4 or 8.
10. Article according to claim 9 which is a copper roof tile.

# EXAMINATION COMMITTEE I

Candidate No. \_\_\_\_\_

Paper A (Chemistry) 2009 - Schedule of marks

Category	Maximum possible	Marks awarded	
		Marker	Marker
Process for patinating	40		
Patinating solution	10		
Article	20		
<b>Independent claims</b>	<b>70</b>		
<b>Dependent claims</b>	<b>15</b>		
<b>Description</b>	<b>15</b>		
<b>Total</b>	<b>100</b>		

Sub-Committee for Chemistry agrees on ..... marks and recommends the following grade to the Examination Board:

PASS  
(50-100)

FAIL  
(0-49)  
COMPENSABLE FAIL  
(45-49, in case the candidate sits  
the examination for the first time)

3 July 2009

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Chairman of Examination Committee I