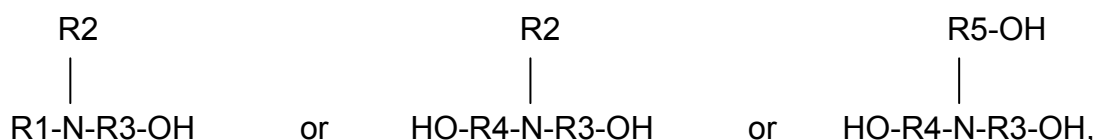


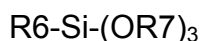
Candidate's Answer

1. A method of restoring of concrete structures having embedded steel reinforcements comprising impregnation of the surface of a hardened concrete structure with an aqueous composition containing a corrosion inhibitor which comprises a mixture of an alkanolamine of the formula:



in which R1 and R2 are, independently, hydrogen, C1-C6 alkyl or C4-C6 cycloalkyl and wherein R3, R4 and R5 are, independently, C2-C6 alkylene or C4-C6 cycloalkylene; and an alkaline metal nitrite or an alkaline earth metal nitrite.

2. The method of claim 1 wherein the aqueous corrosion inhibitor composition is used in a total amount of 200-2000 g/m².
3. The method of claim 1 or 2 wherein the aqueous composition is applied on the concrete surface by brush, by paint roller or by a spraying device.
4. An aqueous composition for use in the restoration method of claim 1 comprising an alkanolamine of the formula as defined in claim 1 and an alkaline metal nitrite or an alkaline earth metal nitrite and an alkylalkoxysilane of the formula:



in which R6 is C6-C16 alkyl and R7 is C1-C3 alkyl.

5. The composition of claim 4 further comprising a surfactant.
6. The composition of claim 5 comprising 10-20 wt% of the corrosion inhibitor as defined in claim 1. 15-25 wt% of the alkylalkoxysilane as defined in claim 4. 1-5 wt% of surfactant. the remainder being water.

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7. The composition of claim 6, where the alkanolamine is selected from 3-aminopropanol, 2-aminoethanol, 2-(dimethylamino)-ethanol, 2-(ethylamino)ethanol, 2-(butylamino)ethanol, 2-[(1,1-dimethylethyl)amino]ethanol, 2-(cyclohexylamino)ethanol, and triethanolamine, and the nitrite is selected from sodium and calcium nitrite.
8. The composition of claim 4 where the weight ratio of alkanolamine to nitrite is 5:1 to 1:5.

Response

EP patent application no. ...

Dear Sirs,

In response to the communication dated ... an amended set of claims 1-8 is hereby filed to replace the claims 1-4 previously on file.

1. Amendments Art 123 (2) EPC

- 1.1 The new claims are amended such that they now relate to a method for restoration of concrete structures having embedded steel reinforcements and to an aqueous composition for use in the method.
- 1.2 The amended claims have basis in the following parts of the application as filed:

<u>New claim</u>	<u>basis</u>
1	orig. claim 1 + p. 4, lines 26-31
2	p. 5, line 11
3	p. 5, lines 9-11
4	p. 5, lines 12-17
5	p. 5, lines 23-25
6	p. 5, lines 27-29
7	orig. claims 2+3
8	original claim 4

2. Novelty

2.1 Novelty of claim 1

The method of claim 1 is novel over D1 and D2. D1 discloses restoration of reinforced concrete structures comprising removing concrete, cleaning or replacing the reinforcing members and treating the members with a composition containing resin and corrosion inhibitor. D1 does not teach the use of an aqueous composition containing the corrosion inhibitor for impregnating hardened concrete. D2 discloses the use of the corrosion inhibitor for protecting concrete structures from corrosion. D2 is silent on restoration of reinforced concrete structures. The subject matter is thus novel over both D1 and D2.

2.2 Novelty of claim 4

Claim 4 relates to a composition containing alkanolamine, nitrite and alkylalkoxysilane. D1 discloses a composition containing alkyd resin, butylglycol, nitrite and alkanolamine. D1 does not mention any alkylalkoxysilane. D2 discloses an aqueous solution of alkanolamine and nitrite, but does not mention alkylalkoxysilane. The subject matter of claim 4 is thus novel over both D1 and D2.

3. Inventive step

3.1 Claim 1

D1 is considered to be the closest prior art since it also relates to the field of restoration of reinforced concrete structures. D2 is less relevant since it does not relate to restoration of concrete structures.

3.2 The subject-matter of claim 1 differs from what is known through D1 in that the concrete surface is impregnated with the corrosion inhibitor containing aqueous composition as set out in claim 1. The impregnation with the composition results in a decreased corrosion potential as can be clearly seen in the table on p. 10 of the application, samples II-VII.

- 3.3 In view of D1, it is considered that the technical problem to be solved is to find a way to reduce the corrosion rate of the steel reinforcements.
- 3.4 This problem is solved by the method as set out in claim 1, which involves impregnation of the concrete surface with the inhibitor composition.
- 3.5 The restoration method disclosed in D1 involves removal of the concrete. There is no hint in D1 towards treating the concrete surface instead of removing it. The skilled person faced with the above problem would thus not try to apply the composition directly to the concrete surface, instead he is instructed by D1 to apply the coating to the steel reinforcements. D2 does not give any hint towards restoration of hardened concrete structures whatsoever and does therefore not contain any information that could help the skilled person solve the problem.
- 3.6 The skilled person faced with the above problem and having knowledge of D2 would thus not arrive at the method of claim 1. The subject-matter of claim 1 therefore involves an inventive step.
- 3.7 Inventive step for claim 4
D1 is considered to be the closest prior art for assessing inventive step for claim 4, since it relates to restoration of concrete structures, which is the same application as intended for the composition of claim 4. However, the composition itself as disclosed in D1 is not closer to the one of claim 4 than is the composition of D2.
- 3.8 The composition of claim 4 differs from the one of D1 in that it comprises the alkylalkoxysilane. This component in the composition has the effect of improving, i.e. reducing the corrosion rate of the treated concrete structure, as is evident from the table on page 10 of the application.
- 3.9 The problem to be solved is thus to find a composition that reduces the corrosion rate of the steel reinforcements.

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- 3.10 This problem is solved by the inclusion of the alkylalkoxysilane as set out in claim 4. In the table on p. 10 it can clearly be seen that the presence of alkylalkoxysilane leads to a higher value of the corrosion potential, i.e. to a lower corrosion rate, see samples IV-VII.
- 3.11 D1 gives no hint towards the use of an alkylalkoxysilane in the composition. The skilled person would thus not add this component to his composition. D2 gives no hint towards the addition of alkylalkoxysilane to the composition.
- 3.12 The person skilled in the art wanting to reduce the corrosion rate of the steel reinforcements in concrete and having knowledge of both D1 and D2 would thus not arrive at the composition as defined in claim 4. The subject matter of claim 4 thus involves an inventive step.
- 3.13 Dependent claims
Inventive step and novelty of dependent claims are not discussed as the independent claims are novel and inventive (GL C-IV, 9.5a)

Points of the Communication

- 1.-3. The amended claims relate to a restoration method and a composition for use in the method, which are novel and inventive (see points 2. and 3. above).
4. The new claims are novel (see p. 2) involve an inventive step (see p. 3) and involve all essential features. As to unity the common inventive feature for claims 1 and 4 is the ability of the corrosion inhibitor to penetrate into the concrete material, which ability makes the method possible. As shown in p. 1.2 above all claims find basis in the application as filed.
5. The difference between the claims and the state of the art is described under point 3.2 and 3.8 above. As to technical problem see p. 3.3 and 3.9 and solution see p. 3.4 and 3.10.

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6. The independent claims contain all essential features.
 7. See point 1.2 above.
 8. The description will be amended for conformity with the claims once the Examiner has confirmed the allowability of the new claims.

Oral proceedings are requested only if the Examining Division is minded to refuse the application.

Yours faithfully
.....[Signature]

Note to Examiner

A corrosion inhibitor comprising calcium nitrite and triethanolamine in a weight ratio of 1:1 seems to be novel and inventive and could therefore be filed in a divisional application. As the components of the composition are chosen from two lists in accordance with T 7/86 and the specific combination of calcium nitrite and triethanol is not mentioned in D1 or D2 there is novelty. Inventive step could be argued by using the effects shown in the tables on p. 6 and 8.

The unity between this composition and claim 1 & claim 4 is weak since the effect of the composition without the silane is not so much improved.