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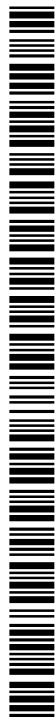
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: KERATIN DYEING COMPOUNDS, KERATIN DYEING COMPOSITIONS CONTAINING THEM, AND USE THEREOF

(57) Abstract: Compositions for the oxidative dyeing of keratin fibers, comprising a medium suitable for dyeing and one or more tricyclic fused 6-5-6 heteroaromatic keratin dyeing compounds having one heteroatom. A method for oxidative dyeing of keratin fibers, comprising applying such compositions in the presence of an oxidizing agent, for a period sufficient to develop the desired coloration.



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## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US2005/011810A. CLASSIFICATION OF SUBJECT MATTER  
A61K7/13

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, EMBASE, BIOSIS, CHEM ABS Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 27 15 680 A1 (HENKEL KGAA) 12 October 1978 (1978-10-12) claims 1-9 page 3, lines 1-3 page 9, paragraph 4 page 14 example	1-10
P, X	EP 1 437 122 A (L'OREAL) 14 July 2004 (2004-07-14) claims 1,4,10-12,15-19 pages 13-14; example 6 compound 4 pages 14-15; example 10	1-10
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 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

° Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

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- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*&\* document member of the same patent family

Date of the actual completion of the international search

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## INTERNATIONAL SEARCH REPORT

International Application No  
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	EP 1 435 228 A (L'OREAL) 7 July 2004 (2004-07-07) claims 1,4,15,17,19 pages 8-9; example 1 pages 9-11; example 3 -----	1-10
P,X	EP 1 435 227 A (L'OREAL) 7 July 2004 (2004-07-07) claims 1,4,10-12,15,17-19 pages 18-20; example 5 -----	1-10
X	US 1 751 638 A (JOHNSON OSCAR W) 25 March 1930 (1930-03-25) page 2; example 2 -----	1-10
A	US 2 281 583 A (KRANZLCIN PAUL) 5 May 1942 (1942-05-05) page 1, line 25 page 1, lines 41-47 -----	1-10
A	KYZIOL J B; LYZNIAK A: "2-Aminocarbazole Synthesis" TETRAHEDRON, vol. 36, no. 20-21, 1980, pages 3017-3019, XP002349627 Pergamon Press, UK page 3017, paragraph 1 page 3017 Figure -----	1-10

INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2005/011810

**Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
  
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1.  As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
  
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  
3.  As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:  
1-10 (part)

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-10 (part)

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

A keratin dyeing composition comprising:

(A) a medium suitable for dyeing; and  
 (B) one or more tricyclic fused 6-5-6 heteroaromatic keratin dyeing compounds having one heteroatom according to the formula (...) wherein Y is NA1;

wherein at least one of R1, R2, R3, R4, R5, R6, R7, and R8 is selected from the group consisting of:

(a) C-linked monovalent substituents selected from the group consisting of:

(i) substituted or unsubstituted, straight or branched, alkyl, mono- or polyunsaturated alkyl, heteroalkyl, aliphatic, heteroaliphatic, or heteroolefinic systems,  
 (ii) substituted or unsubstituted, mono- or poly-cyclic aliphatic, aryl, or heterocyclic systems, and  
 (iii) substituted or unsubstituted, mono-, poly-, or per-fluoro alkyl systems; wherein said systems of (i), (ii) and (iii) comprise from 1 to 10 carbon atoms and from 0 to 5 heteroatoms selected from the group consisting of O, S, N, P, and Si; and

the remaining R one of:

(b) S-linked monovalent substituents selected from the group consisting of SA1, SO2A1, SO3A1, SSA1, SOA1, SO2NA1A2, SNA1A2, and SONA1A2;

(c) O-linked monovalent substituents selected from the group consisting of OA1, and ONA1A2;

(d) N-linked monovalent substituents selected from the group consisting of NA1A2, (NA1A2A3)+, NA1OA2, NA1SA2, NO2, N=NA1, N=NOA1, NA1CN, and NA1NA2A3;

(e) monovalent substituents selected from the group consisting of COA1, CON(A1)2, CONA1COA2, C(=NA1)NA1A2, CN, and X;

(f) fluoroalkyl monovalent substituents selected from the group consisting of mono-, poly-, and per-fluoro alkyl systems comprising from 1 to 12 carbon atoms and from 0 to 4 heteroatoms; and

(g) hydrogen;

wherein A1, A2, and A3 are monovalent and are independently selected from the group consisting of: H; substituted or unsubstituted, straight or branched, alkyl, mono- or polyunsaturated alkyl, heteroalkyl, aliphatic, heteroaliphatic, or heteroolefinic systems; substituted or unsubstituted, mono- or poly-cyclic aliphatic, aryl, or heterocyclic systems; and substituted or unsubstituted, mono-, poly-, per-fluoro alkyl systems or A1 and A2 together with nitrogen atom to which they are bound form a ring; wherein said systems comprise from 1 to 10 carbon atoms and from 0 to 5 heteroatoms selected from the group consisting of O, S, N, P, and Si, and

wherein X is a halogen selected from the group consisting of F, Cl, Br, and I;

a method of dyeing hair comprising applying said composition;

a kit comprising said composition.

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## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

## 2. claims: 1-10 (part)

A keratin dyeing composition comprising:

- (A) a medium suitable for dyeing; and  
(B) one or more tricyclic fused 6-5-6 heteroaromatic keratin dyeing compounds having one heteroatom according to the formula (...) wherein Y is NA1;  
wherein at least one of R1, R2, R3, R4, R5, R6, R7, and R8 is selected from the group consisting of:  
(b) S-linked monovalent substituents selected from the group consisting of SA1, SO2A1, SO3A1, SSA1, SOA1, SO2NA1A2, SNA1A2, and SONA1A2; and  
the remaining R are the same or different and are selected from:  
(a)(i), (ii), (iii); (c); (d); (e); (f); and (g);  
wherein A1, A2, and A3 are (...);  
wherein said systems comprise (...), and  
wherein X is a halogen (...);  
a method of dyeing hair comprising applying said composition;  
a kit comprising said composition.
- 

## 3. claims: 1-10 (part)

A keratin dyeing composition comprising:

- (A) a medium suitable for dyeing; and  
(B) one or more tricyclic fused 6-5-6 heteroaromatic keratin dyeing compounds having one heteroatom according to the formula (...) wherein Y is NA1;  
wherein at least one of R1, R2, R3, R4, R5, R6, R7, and R8 is selected from the group consisting of:  
(c) O-linked monovalent substituents selected from the group consisting of OA1, and ONA1A2; and  
the remaining R are the same or different and are selected from:  
(a)(i), (ii), (iii); (b); (d); (e); (f); and (g);  
wherein A1, A2, and A3 are (...);  
wherein said systems comprise (...), and  
wherein X is a halogen (...);  
a method of dyeing hair comprising applying said composition;  
a kit comprising said composition.
- 

## 4. claims: 1-10 (part)

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

A keratin dyeing composition comprising:  
 (A) a medium suitable for dyeing; and  
 (B) one or more tricyclic fused 6-5-6 heteroaromatic keratin dyeing compounds having one heteroatom according to the formula (...) wherein Y is NA1;  
 wherein at least one of R1, R2, R3, R4, R5, R6, R7, and R8 is selected from the group consisting of:  
 (d) N-linked monovalent substituents selected from the group consisting of NA1A2, (NA1A2A3)+, NA1OA2, NA1SA2, NO2, N=NA1, N=NOA1, NA1CN, and NA1NA2A3; and  
 the remaining R are the same or different and are selected from:  
 (a)(i), (ii), (iii); (b); (c); (e); (f); and (g);  
 wherein A1, A2, and A3 are (...);  
 wherein said systems comprise (...), and  
 wherein X is a halogen (...);  
 a method of dyeing hair comprising applying said composition;  
 a kit comprising said composition.

## 5. claims: 1-10 (part)

A keratin dyeing composition comprising:  
 (A) a medium suitable for dyeing; and  
 (B) one or more tricyclic fused 6-5-6 heteroaromatic keratin dyeing compounds having one heteroatom according to the formula (...) wherein Y is NA1;  
 wherein at least one of R1, R2, R3, R4, R5, R6, R7, and R8 is selected from the group consisting of:  
 (e) monovalent substituents selected from the group consisting of COA1, CON(A1)2, CONA1COA2, C(=NA1)NA1A2, CN, and X; and  
 the remaining R are the same or different and are selected from:  
 (a)(i), (ii), (iii); (b); (c); (d); (f); and (g);  
 wherein A1, A2, and A3 are (...);  
 wherein said systems comprise (...), and  
 wherein X is a halogen (...);  
 a method of dyeing hair comprising applying said composition;  
 a kit comprising said composition.

## 6. claims: 1-10 (part)



## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

A keratin dyeing composition comprising:  
 (A) a medium suitable for dyeing; and  
 (B) one or more tricyclic fused 6-5-6 heteroaromatic keratin dyeing compounds having one heteroatom according to the formula (...) wherein Y is NA1;  
 wherein R1, R2, R3, R4, R5, R6, R7, and R8 are the same or different and are selected from the group consisting of:  
 (f) fluoroalkyl monovalent substituents selected from the group consisting of mono-, poly-, and per-fluoro alkyl systems comprising from 1 to 12 carbon atoms and from 0 to 4 heteroatoms; and  
 the remaining R are the same or different and are selected from:  
 (a)(i), (ii), (iii); (b); (c); (d); (e); and (g);  
 wherein A1, A2, and A3 are (...);  
 wherein said systems comprise (...), and  
 wherein X is a halogen (...);  
 a method of dyeing hair comprising applying said composition;  
 a kit comprising said composition.

## 7. claims: 1-10 (part)

A keratin dyeing composition comprising:  
 (A) a medium suitable for dyeing; and  
 (B) one or more tricyclic fused 6-5-6 heteroaromatic keratin dyeing compounds having one heteroatom according to the formula (...) wherein Y is NA1;  
 wherein at least one of R1, R2, R3, R4, R5, R6, R7, and R8 is:  
 (g) hydrogen; and  
 the remaining R are the same or different and are selected from:  
 (a)(i), (ii), (iii); (b); (c); (d); (e); and (f);  
 wherein A1, A2, and A3 are (...);  
 wherein said systems comprise (...), and  
 wherein X is a halogen (...);  
 a method of dyeing hair comprising applying said composition;  
 a kit comprising said composition.

## 8. claims: 1-10 (part)

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

A keratin dyeing composition comprising:

(A) a medium suitable for dyeing; and  
 (B) one or more tricyclic fused 6-5-6 heteroaromatic keratin dyeing compounds having one heteroatom according to the formula (...) wherein Y is O;

wherein at least one of R1, R2, R3, R4, R5, R6, R7, and R8 is selected from the group consisting of:

(a) C-linked monovalent substituents selected from the group consisting of:

(i) substituted or unsubstituted, straight or branched, alkyl, mono- or polyunsaturated alkyl, heteroalkyl, aliphatic, heteroaliphatic, or heteroolefinic systems,  
 (ii) substituted or unsubstituted, mono- or poly-cyclic aliphatic, aryl, or heterocyclic systems, and  
 (iii) substituted or unsubstituted, mono-, poly-, or per-fluoro alkyl systems; wherein said systems of (i), (ii) and (iii) comprise from 1 to 10 carbon atoms and from 0 to 5 heteroatoms selected from the group consisting of O, S, N, P, and Si; and

the remaining R are one of:

(b) S-linked monovalent substituents selected from the group consisting of SA1, SO2A1, SO3A1, SSA1, SOA1, SO2NA1A2, SNA1A2, and SONA1A2;

(c) O-linked monovalent substituents selected from the group consisting of OA1, and ONA1A2;

(d) N-linked monovalent substituents selected from the group consisting of NA1A2, (NA1A2A3)+, NA1OA2, NA1SA2, NO2, N=NA1, N=NOA1, NA1CN, and NA1NA2A3;

(e) monovalent substituents selected from the group consisting of COOA1, CON(A1)2, CONA1COA2, C(=NA1)NA1A2, CN, and X;

(f) fluoroalkyl monovalent substituents selected from the group consisting of mono-, poly-, and per-fluoro alkyl systems comprising from 1 to 12 carbon atoms and from 0 to 4 heteroatoms; and

(g) hydrogen;

wherein A1, A2, and A3 are monovalent and are independently selected from the group consisting of: H; substituted or unsubstituted, straight or branched, alkyl, mono- or polyunsaturated alkyl, heteroalkyl, aliphatic, heteroaliphatic, or heteroolefinic systems; substituted or unsubstituted, mono- or poly-cyclic aliphatic, aryl, or heterocyclic systems; and substituted or unsubstituted, mono-, poly-, per-fluoro alkyl systems or A1 and A2 together with nitrogen atom to which they are bound form a ring; wherein said systems comprise from 1 to 10 carbon atoms and from 0 to 5 heteroatoms selected from the group consisting of O, S, N, P, and Si, and

wherein X is a halogen selected from the group consisting of F, Cl, Br, and I;

a method of dyeing hair comprising applying said composition;

a kit comprising said composition.

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

## 9. claims: 1-10 (part)

A keratin dyeing composition comprising:

- (A) a medium suitable for dyeing; and
  - (B) one or more tricyclic fused 6-5-6 heteroaromatic keratin dyeing compounds having one heteroatom according to the formula (...) wherein Y is O; wherein at least one of R1, R2, R3, R4, R5, R6, R7, and R8 is selected from the group consisting of:
    - (b) S-linked monovalent substituents selected from the group consisting of SA1, SO2A1, SO3A1, SSA1, SOA1, SO2NA1A2, SNA1A2, and SONA1A2; and the remaining R are the same or different and are selected from:
      - (a)(i), (ii), (iii); (c); (d); (e); (f); and (g); wherein A1, A2, and A3 are (...); wherein said systems comprise (...), and wherein X is a halogen (...);
- a method of dyeing hair comprising applying said composition;  
a kit comprising said composition.
- 

## 10. claims: 1-10 (part)

A keratin dyeing composition comprising:

- (A) a medium suitable for dyeing; and
  - (B) one or more tricyclic fused 6-5-6 heteroaromatic keratin dyeing compounds having one heteroatom according to the formula (...) wherein Y is O; wherein at least one of R1, R2, R3, R4, R5, R6, R7, and R8 is selected from the group consisting of:
    - (c) O-linked monovalent substituents selected from the group consisting of OA1, and ONA1A2; and the remaining R are the same or different and are selected from:
      - (a)(i), (ii), (iii); (b); (d); (e); (f); and (g); wherein A1, A2, and A3 are (...); wherein said systems comprise (...), and wherein X is a halogen (...);
- a method of dyeing hair comprising applying said composition;  
a kit comprising said composition.
- 

## 11. claims: 1-10 (part)

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

A keratin dyeing composition comprising:  
 A keratin dyeing composition comprising:  
 (A) a medium suitable for dyeing; and  
 (B) one or more tricyclic fused 6-5-6 heteroaromatic keratin dyeing compounds having one heteroatom according to the formula (...) wherein Y is O;  
 wherein at least one of R1, R2, R3, R4, R5, R6, R7, and R8 is selected from the group consisting of:  
 (d) N-linked monovalent substituents selected from the group consisting of NA1A2, (NA1A2A3)+, NA10A2, NA1SA2, NO2, N=NA1, N=NOA1, NA1CN, and NA1NA2A3; and  
 the remaining R are the same or different and are selected from:  
 (a)(i), (ii), (iii); (b); (c); (e); (f); and (g);  
 wherein A1, A2, and A3 are (...);  
 wherein said systems comprise (...), and  
 wherein X is a halogen (...);  
 a method of dyeing hair comprising applying said composition;  
 a kit comprising said composition.

## 12. claims: 1-10 (part)

A keratin dyeing composition comprising:  
 (A) a medium suitable for dyeing; and  
 (B) one or more tricyclic fused 6-5-6 heteroaromatic keratin dyeing compounds having one heteroatom according to the formula (...) wherein Y is O;  
 wherein at least one of R1, R2, R3, R4, R5, R6, R7, and R8 is selected from the group consisting of:  
 (e) monovalent substituents selected from the group consisting of COA1, CON(A1)2, CONA1COA2, C(=NA1)NA1A2, CN, and X; and  
 the remaining R are the same or different and are selected from:  
 (a)(i), (ii), (iii); (b); (c); (d); (f); and (g);  
 wherein A1, A2, and A3 are (...);  
 wherein said systems comprise (...), and  
 wherein X is a halogen (...);  
 a method of dyeing hair comprising applying said composition;  
 a kit comprising said composition.

## 13. claims: 1-10 (part)

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

A keratin dyeing composition comprising:  
 (A) a medium suitable for dyeing; and  
 (B) one or more tricyclic fused 6-5-6 heteroaromatic keratin dyeing compounds having one heteroatom according to the formula (...) wherein Y is O;  
 wherein R1, R2, R3, R4, R5, R6, R7, and R8 are the same or different and are selected from the group consisting of:  
 (f) fluoroalkyl monovalent substituents selected from the group consisting of mono-, poly-, and per-fluoro alkyl systems comprising from 1 to 12 carbon atoms and from 0 to 4 heteroatoms; and  
 the remaining R are the same or different and are selected from:  
 (a)(i), (ii), (iii); (b); (c); (d); (e); and (g);  
 wherein A1, A2, and A3 are (...);  
 wherein said systems comprise (...), and  
 wherein X is a halogen (...);  
 a method of dyeing hair comprising applying said composition;  
 a kit comprising said composition.

## 14. claims: 1-10 (part)

A keratin dyeing composition comprising:  
 (A) a medium suitable for dyeing; and  
 (B) one or more tricyclic fused 6-5-6 heteroaromatic keratin dyeing compounds having one heteroatom according to the formula (...) wherein Y is O;  
 wherein at least one of R1, R2, R3, R4, R5, R6, R7, and R8 is:  
 (g) hydrogen; and  
 the remaining R are the same or different and are selected from:  
 (a)(i), (ii), (iii); (b); (c); (d); (e); and (f);  
 wherein A1, A2, and A3 are (...);  
 wherein said systems comprise (...), and  
 wherein X is a halogen (...);  
 a method of dyeing hair comprising applying said composition;  
 a kit comprising said composition.

## 15. claims: 1-10 (part)

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

A keratin dyeing composition comprising:

- (A) a medium suitable for dyeing; and  
 (B) one or more tricyclic fused 6-5-6 heteroaromatic keratin dyeing compounds having one heteroatom according to the formula (...) wherein Y is S;  
 wherein at least one of R1, R2, R3, R4, R5, R6, R7, and R8 is selected from the group consisting of:  
 (a) C-linked monovalent substituents selected from the group consisting of:  
 (i) substituted or unsubstituted, straight or branched, alkyl, mono- or polyunsaturated alkyl, heteroalkyl, aliphatic, heteroaliphatic, or heteroolefinic systems,  
 (ii) substituted or unsubstituted, mono- or poly-cyclic aliphatic, aryl, or heterocyclic systems, and  
 (iii) substituted or unsubstituted, mono-, poly-, or per-fluoro alkyl systems; wherein said systems of (i), (ii) and (iii) comprise from 1 to 10 carbon atoms and from 0 to 5 heteroatoms selected from the group consisting of O, S, N, P, and Si;  
 (b) S-linked monovalent substituents selected from the group consisting of SA1, SO2A1, SO3A1, SSA1, SOA1, SO2NA1A2, SNA1A2, and SONA1A2;  
 (c) O-linked monovalent substituents selected from the group consisting of OA1, and ONA1A2;  
 (d) N-linked monovalent substituents selected from the group consisting of NA1A2, (NA1A2A3)+, NA10A2, NA1SA2, NO2, N=NA1, N=NOA1, NA1CN, and NA1NA2A3;  
 (e) monovalent substituents selected from the group consisting of COOA1, CON(A1)2, CONA1COA2, C(=NA1)NA1A2, CN, and X;  
 (f) fluoroalkyl monovalent substituents selected from the group consisting of mono-, poly-, and per-fluoro alkyl systems comprising from 1 to 12 carbon atoms and from 0 to 4 heteroatoms; and  
 (g) hydrogen;  
 wherein A1, A2, and A3 are monovalent and are independently selected from the group consisting of: H; substituted or unsubstituted, straight or branched, alkyl, mono- or polyunsaturated alkyl, heteroalkyl, aliphatic, heteroaliphatic, or heteroolefinic systems; substituted or unsubstituted, mono- or poly-cyclic aliphatic, aryl, or heterocyclic systems; and substituted or unsubstituted, mono-, poly-, per-fluoro alkyl systems or A1 and A2 together with nitrogen atom to which they are bound form a ring; wherein said systems comprise from 1 to 10 carbon atoms and from 0 to 5 heteroatoms selected from the group consisting of O, S, N, P, and Si, and  
 wherein X is a halogen selected from the group consisting of F, Cl, Br, and I;  
 a method of dyeing hair comprising applying said composition;  
 a kit comprising said composition.

## INTERNATIONAL SEARCH REPORT

Information on patent family members

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