



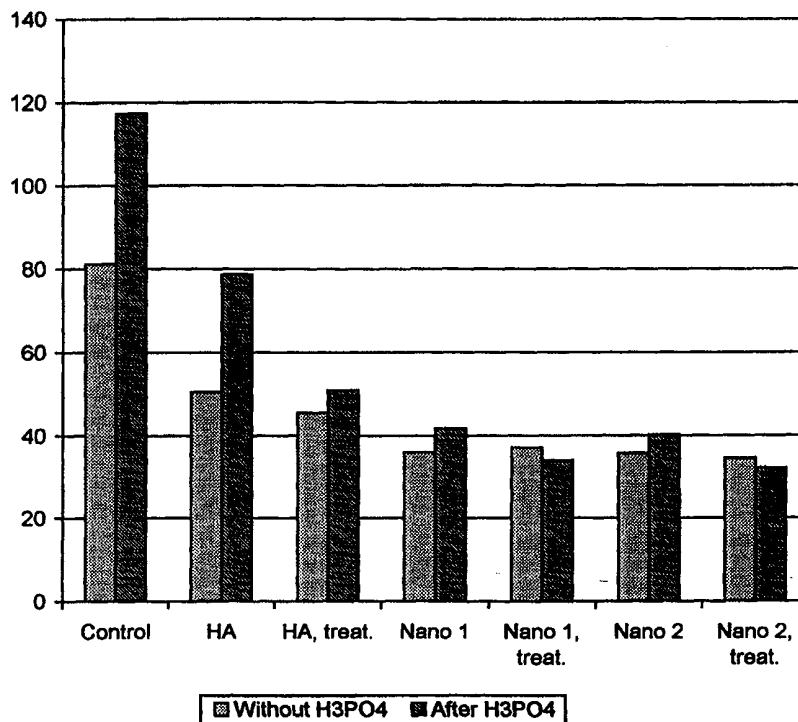
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/IT99/00224</p> <p>(22) International Filing Date: 16 July 1999 (16.07.99)</p> <p>(30) Priority Data: RM98A000476 17 July 1998 (17.07.98) IT</p> <p>(71)(72) Applicants and Inventors: DOLCI, Giovanni [IT/IT]; Via Antonio Guarnieri, 51, I-00124 Roma (IT). MONGIORGI, Romano [IT/IT]; Via Canovella, 3/2, I-40043 Marzabotto (IT). PRATI, Carlo [IT/IT]; Via Mameli, 18, I-47100 Forli (IT). VALDRE', Giovanni [IT/IT]; Via Mascarella, 77/2, I-40126 Bologna (IT).</p> <p>(74) Agents: BANCHETTI, Marina et al.; Ing. Barzandè & Zanardo Roma S.p.A., Via Piemonte, 26, I-00187 Roma (IT).</p>	<p>(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p> <p>(88) Date of publication of the international search report: 11 May 2000 (11.05.00)</p>	

(54) Title: ODONTOSTOMATOLOGIC USE OF APATITE-BASED NANOSTRUCTURED MATERIALS

(57) Abstract

Biocompatible nanocrystalline materials based on apatite with high specific surface properties, having average size of the crystallites comprised between 0.5 and 200 nm and possible lattice deformations and/or defects, are proposed for use in the fields of dentistry and dental hygiene, in particular for the production of preparations, solutions, toothpastes and materials for the remineralisation of enamel and dentine and for the treatment of dentine hypersensitivity. The apatite-based nanostructured materials appear to possess specific physico-chemical properties connected to their nanocrystalline and defective nature, such as the remarkable surface chemical reactivity and the hygroscopicity, which allow the material to recrystallise as a result of the metastable character of the nanocrystalline system, to be used for the remineralisation of enamel and dentine. In addition, they possess the most suitable grain sizes to easily and deeply penetrate mechanically within the dentinal tubules, and also cause it to cement the internal surface thereof, both by swelling and by readily reacting with the natural tissues.



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INTERNATIONAL SEARCH REPORT

International Application No

PCT/IT 99/00224

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>WO 98 16268 A (REY CHRISTIAN ;AIOLOVA MARIA (US); ETEX CORP (US); LEE DOSUK D (US) 23 April 1998 (1998-04-23) figure 26 page 11, line 28 - line 30 page 46, line 32 -page 50, line 20 page 56, line 23 -page 58, line 1 table 1, samples 1-1,1-2,1-3 claims 1,2,6,8,9,14,34,37,57,59,60,68,69,77</p>	1,4,6,7, 10,17, 18,20
X	<p>WO 97 41273 A (BIOTECNIC S A ;RANZ XAVIER (FR); REY CHRISTIAN (FR); 3C RESEARCH S) 6 November 1997 (1997-11-06) page 3, line 3 - line 24 page 7, line 1 - line 7 page 10, line 2 - line 4 claims 1,7,13,16</p>	1-6, 8-10,17, 19,20
X	<p>ATSUSHI N ET AL: "Synthesis and sintering behavior of hydroxyapatite by chemical process" COMPENDEX / EIX97353729434,1997, XP002131868 -& FUNTAI FUNMATSU YAKIN KYOKAI, Kyoto, Japan vol.44, no. 4, April 1997 (1997-04), pages 340-347 Original Japanese language document 'Compendex database abstract in English!</p>	1,2,7
Y	<p>DE GROOT ET AL: "Morphology and composition of nanograde calcium phosphate needle-like crystals formed by simple hydrothermal treatment" JOURNAL OF MATERIALS SCIENCE. MATERIALS IN MEDICINE, vol. 5, no. 6-7, July 1994 (1994-07), pages 326-331, XP002131869 London, England the whole document</p>	1-10, 15-21,27
Y	<p>EP 0 323 632 A (ASAHI OPTICAL CO LTD) 12 July 1989 (1989-07-12) claims 1-6,12,17-20,29,30</p>	1-10, 15-21,27
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INTERNATIONAL SEARCH REPORT

In. tional Application No
PCT/IT 99/00224

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	IT 1 271 874 B (MINOZZI MASSIMO) 9 June 1997 (1997-06-09) cited in the application the whole document	1-7, 10, 17, 18, 20, 23

INTERNATIONAL SEARCH REPORT

national application No

PCT/IT 99/00224

Box I Observations where certain claims were found unsearchable (Continuation of item 1 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 II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

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

See further information sheets Form PCT/ISA/210

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.

Remark on Protest

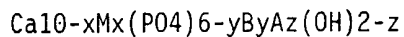
- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

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 (part), 4-6 (part), 7, 9-17 (part), 18, 19-27 (part)

Use of apatite-based nanostructured material of the general formula:



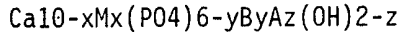
having average size of the crystallites comprised between 0.5 and 200 nm for the production of preparations for odontostomatologic applications

wherein x, y, and z = 0 (hydroxyapatite)*

[*this is the first invention as outlined in claim 1 and is identical to claim 7]

and,

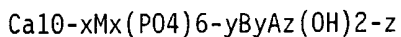
a composition for odontostomatologic use comprising an apatite-based nanostructured material of the general formula:



wherein said nanostructured material is hydroxyapatite

2. Claims: 1-6 (part), 9 (part), 10-17 (part), 19-27 (part)

Use of apatite-based nanostructured material of the general formula:

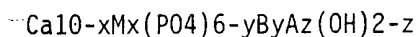


having average size of the crystallites comprised between 0.5 and 200 nm for the production of preparations for odontostomatologic applications

wherein, M cation = M⁺ and x = 1-9

and,

a composition for odontostomatologic use comprising an apatite-based nanostructured material of the general formula:

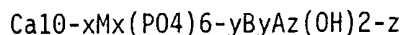


wherein, M cation = M⁺ and x = 1-9

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

3. Claims: 1-6 (part), 9 (part), 10-17 (part), 19-27 (part)

Use of apatite-based nanostructured material of the general formula:

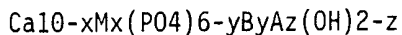


having average size of the crystallites comprised between 0.5 and 200 nm for the production of preparations for odontostomatologic applications

wherein, M cation = M²⁺ and x = 1-9

and,

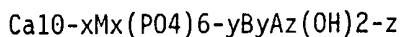
a composition for odontostomatologic use comprising an apatite-based nanostructured material of the general formula:



wherein, M cation = M²⁺ and x = 1-9

4. Claims: 1-6 (part), 9 (part), 10-17 (part), 19-27 (part)

Use of apatite-based nanostructured material of the general formula:

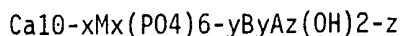


having average size of the crystallites comprised between 0.5 and 200 nm for the production of preparations for odontostomatologic applications

wherein, M cation = M²⁺ and x = 1-9

and,

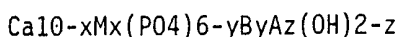
a composition for odontostomatologic use comprising an apatite-based nanostructured material of the general formula:



wherein, M cation = M²⁺ and x = 1-9

5. Claims: 1 (part), 2 (part), 4 (part), 5 (part), 6 (part), 8, 9-17 (part), 19-27 (part)

Use of apatite-based nanostructured material of the general formula:



FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

having average size of the crystallites comprised between 0.5 and 200 nm for the production of preparations for odontostomatologic applications

wherein $x = 0$, $y = 0-9$, $z = 0-9$, but not $x = y = z = 0$

and,

a composition for odontostomatologic use comprising an apatite-based nanostructured material of the general formula:

$Ca_{10-x}M_x(P_4)_{6-y}B_yA_z(OH)_{2-z}$

wherein $x = 0$, $y = 0-9$, $z = 0-9$, but not $x = y = z = 0$

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. Application No

PCT/IT 99/00224

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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