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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
C03C 3/062, 3/097, 3/112, 3/12, 3/247, 3/253, 4/00, H01S 3/17

A3

(11) International Publication Number: **WO 99/47464**

(43) International Publication Date: 23 September 1999 (23.09.99)

(21) International Application Number: PCT/GB99/00726

(22) International Filing Date: 19 March 1999 (19.03.99)

(30) Priority Data:
9805800.1 19 March 1998 (19.03.98) GB

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(81) Designated States: 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, 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).

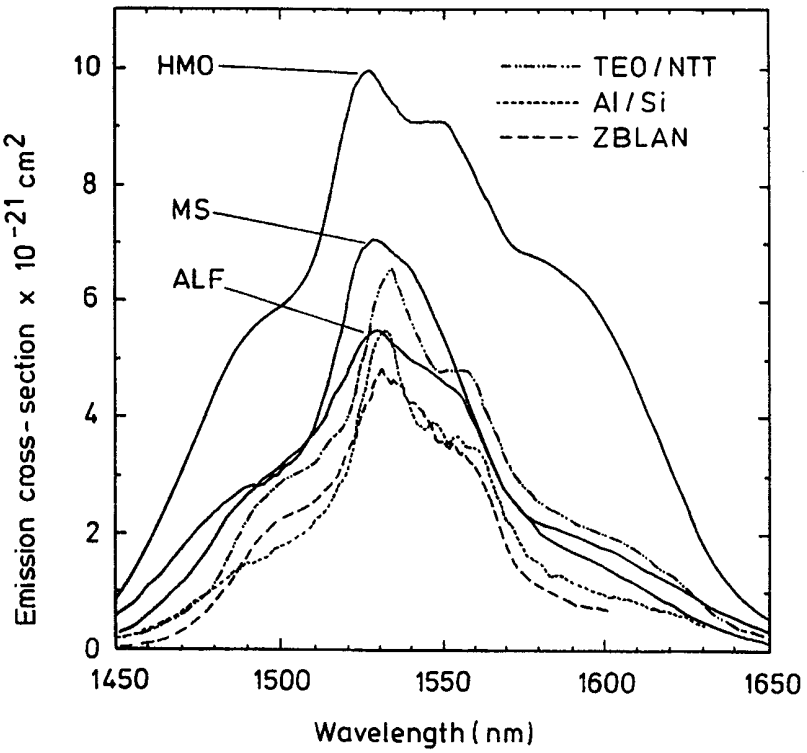
Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(88) Date of publication of the international search report:
4 November 1999 (04.11.99)

(54) Title: ERBIUM DOPED OPTICAL GLASS

(57) Abstract

An erbium doped glass comprising (a) host glass; (b) an effective quantity of erbium dopant; (c) a concentration of 10-40 mol% network modifying metal fluoride; and (d) further ingredients wherein the amounts of (a), (b), (c) and (d) total 100 %.



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INTERNATIONAL SEARCH REPORT

national Application No
PCT/GB 99/00726

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 C03C3/062 C03C3/097 C03C3/112 C03C3/12 C03C3/247
C03C3/253 C03C4/00 H01S3/17

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)
IPC 6 C03C H01S

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 802 169 A (CORNING INC) 22 October 1997 (1997-10-22) claims -& US 5 798 306 A ---	1-4,7, 25,26
X	EP 0 640 571 A (SUMITA OPTICAL GLASS INC ET AL) 1 March 1995 (1995-03-01) claims; examples 1-3 ---	1-4,7
X	YUHU WANG ET AL: "NEW TRANSPARENT VITROCERAMICS CODOPED WITH ER3+ AND YB3+ FOR EFFICIENT FREQUENCY UPCONVERSION" APPLIED PHYSICS LETTERS, vol. 63, no. 24, 13 December 1993 (1993-12-13), pages 3268-3270, XP000416520 page 3268, right-hand column, paragraph 2 --- -/--	1

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
30 August 1999	15. SEP. 1999

Name and mailing address of the ISA	Authorized officer
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3

Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 262 365 A (OYOBE AKIRA ET AL) 16 November 1993 (1993-11-16) column 3, line 35 - column 8, line 56 claims; examples	1-7,25, 26
A	EP 0 673 892 A (CORNING INC) 27 September 1995 (1995-09-27) cited in the application the whole document	1
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A	BAYART D ET AL: "EXPERIMENTAL INVESTIGATION OF THE GAIN FLATNESS CHARACTERISTICS FOR1.55 MUM ERBIUM-DOPED FLUORIDE FIBER AMPLIFIERS" IEEE PHOTONICS TECHNOLOGY LETTERS, vol. 6, no. 5, 1 May 1994 (1994-05-01), pages 613-615, XP000446974 cited in the application	
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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.
X	DE 25 00 317 A (SOUTH AFRICAN INVENTIONS) 24 July 1975 (1975-07-24) claims	8-11
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A	page 40, right-hand column, last paragraph - page 41, left-hand column, paragraph 1; table 1	19-24
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X	SHAHRIARI M R ET AL: "THE EFFECT OF RARE EARTH IONS ON THE THERMAL STABILITY OF AIF3 -BASED GLASSES" JOURNAL OF NON-CRYSTALLINE SOLIDS, vol. 161, no. 1, 1 August 1993 (1993-08-01), pages 77-80, XP000496909 ISSN: 0022-3093 page 77, right-hand column, last paragraph page 79, last paragraph - page 80, paragraph 1; table 2	19-22, 25,26
X	OKADA K. ET AL: "Upconversion fluoresences in A13-ZrF4 Based Fluoride Glass Containing ErF3" MATERIAL SCIENCE FORUM, vol. 32-33, 1988, pages 523-528, XP002113749 page 525, last paragraph; figure 1 table 1	19-22, 25,26
X	PATENT ABSTRACTS OF JAPAN vol. 017, no. 496 (C-1108), 8 September 1993 (1993-09-08) & JP 05 132334 A (SUMITA KOGAKU GLASS KK), 28 May 1993 (1993-05-28) abstract	19,20,22
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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.
X	MOINE, B. ET AL: "Fluorescence dynamics of Er3+ and Ho3+ ions and energy transfer in some fluoride glasses" IEEE JOURNAL OF QUANTUM ELECTRONICS., vol. 25, no. 1, 1 January 1989 (1989-01-01), pages 88-96, XP002113750 IEEE INC. NEW YORK., US ISSN: 0018-9197 page 88, paragraph 3; table 2	19,22

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB 99/00726

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:

1. Claims: 1-7, partially 25, 26
2. Claims: 8-18, partially 25, 26
3. Claims: 19-24, partially 25, 26

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: 1-7, partially 25,26

An erbium doped silica glass comprising:
a) SiO2 host glass,
b) an effective amount of erbium,
c) 10-40 mol% network modifying metal fluoride,
d) further ingredients in amount that a+b+c+d in total is 100%.

2. Claims: 8-18, partially 25,26

An erbium doped tellurite or germanate glass comprising:
a) a host glass comprising one of GeO2 and TeO2,
b) an effective amount of erbium,
c) a network modifying metal oxide,
d) further ingredients in amount that a+b+c+d in total is 100%.

3. Claims: 19-24, partially 25,26

An erbium doped fluoroaluminate glass including:
a) 25-60 mol% AlF3,
b) 40-60 mol% network divalent metal fluoride,
c) an effective amount of erbium,
d) a network modifier comprising any one of YF3,ZrF4,HF4 and mixtures thereof,
e) further ingredients in amount that a+b+c+d+e in total is 100%.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/GB 99/00726

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