

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

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| Applicant's or agent's file reference FPM-11-0176 | FOR FURTHER ACTION | | See item 4 below |
| International application No. PCT/KR2011/006861 | International filing date (<i>day/month/year</i>) 16 September 2011 (16.09.2011) | Priority date (<i>day/month/year</i>) 21 June 2011 (21.06.2011) | |
| International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237 | | | |
| Applicant KOREA ATOMIC ENERGY RESEARCH INSTITUTE | | | |

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|---|-------------------------------------|---|---------------------|--------------------------|------------|----------|--------------------------|-------------|--|--------------------------|------------|----------------------------|-------------------------------------|-----------|---|--------------------------|------------|-------------------------|--------------------------|-------------|--|--------------------------|--------------|---|
| <p>1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).</p> <p>2. This REPORT consists of a total of 8 sheets, including this cover sheet.</p> <p>In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.</p> | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>3. This report contains indications relating to the following items:</p> <table> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. I</td> <td>Basis of the report</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table> <p>4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).</p> | <input checked="" type="checkbox"/> | Box No. I | Basis of the report | <input type="checkbox"/> | Box No. II | Priority | <input type="checkbox"/> | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability | <input type="checkbox"/> | Box No. IV | Lack of unity of invention | <input checked="" type="checkbox"/> | Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement | <input type="checkbox"/> | Box No. VI | Certain documents cited | <input type="checkbox"/> | Box No. VII | Certain defects in the international application | <input type="checkbox"/> | Box No. VIII | Certain observations on the international application |
| <input checked="" type="checkbox"/> | Box No. I | Basis of the report | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> | Box No. II | Priority | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> | Box No. IV | Lack of unity of invention | | | | | | | | | | | | | | | | | | | | | | |
| <input checked="" type="checkbox"/> | Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> | Box No. VI | Certain documents cited | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> | Box No. VII | Certain defects in the international application | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> | Box No. VIII | Certain observations on the international application | | | | | | | | | | | | | | | | | | | | | | |

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| | Date of issuance of this report 23 December 2013 (23.12.2013) |
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PATENT COOPERATION TREATY

TRANSLATION

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To:

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| Date of mailing (day/month/year) | 30.05.2012 |
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| Applicant's or agent's file reference FPM-11-0176 | FOR FURTHER ACTION See paragraph 2 below |
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|---|---|---|
| International application No. PCT/KR2011/006861 | International filing date (day/month/year) 16.09.2011 | Priority date (day/month/year) 21.06.2011 |
|---|---|---|

International Patent Classification (IPC) or both national classification and IPC
G21F 9/28 (2006.01) i

Applicant
KOREA ATOMIC ENERGY RESEARCH INSTITUTE

1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

| | | |
|--|------------------------------------|--------------------|
| Name and mailing address of the ISA/KR | Date of completion of this opinion | Authorized officer |
| Facsimile No. | | Telephone No. |

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/KR2011/006861

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - the international application in the language in which it was filed
 - a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:
 - a. (means)
 - on paper
 - in electronic form

 - b. (time)
 - in the international application as filed
 - together with the international application in electronic form
 - subsequently to this Authority for the purposes of search

4. In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

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| International application No. PCT/KR2011/006861 |
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| Box No. V | Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
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|-------------------------------|--------|---------------|-----|
| 1. Statement | | | |
| Novelty (N) | Claims | 3, 4, 9-18 | YES |
| | Claims | 1, 2, 5-8, 19 | NO |
| Inventive step (IS) | Claims | None | YES |
| | Claims | 1-19 | NO |
| Industrial applicability (IA) | Claims | 1-19 | YES |
| | Claims | None | NO |

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|--------------------------------|--|
| 2. Citations and explanations: | |
|--------------------------------|--|

Reference is made to the following documents:

D1: KR 10-2009-0054087 A (KOREA ATOMIC ENERGY RESEARCH INSTITUTE et al.) 29 May 2009

D2: KR 10-2003-0043126 A (KOREA HYDRO & NUCLEAR POWER CO., LTD. et al.) 02 June 2003

D3: KR 10-2003-0029204 A (ECOPHILE CO., LTD.) 14 April 2003

D4: KR 10-2009-0121840 A (KOREA ATOMIC ENERGY RESEARCH INSTITUTE et al.) 26 November 2009

D5: KR 10-2004-0015855 A (KIM, Soo Sam et al.) 21 February 2004

1. Novelty

1.1 Claim 1

Claim 1 sets forth a complex electrokinetic decontamination device including: an electrolyte supply unit; an electrokinetic unit; an electrode unit, which provides a positive power source and a negative power

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

source; and a pH adjusting unit, which supplies a pH adjusting solution to a region of the positive power source and a region of the negative power source. The complex electrokinetic decontamination device is correspondingly the same as a soil restoring system disclosed in document D1 which uses electrokinetics and includes a central electrode, a side electrode, a power supply means, a moisture content control means, an electrolyte adjusting means, and a pH level adjusting means to control the pH levels of a positive electrode and a negative electrode, thereby restoring a contaminated soil. All technical features of claim 1 are disclosed in document D1. Thus, the invention as set forth in claim 1 is not novel (PCT Article 33(2)).

1.2 Claims 2, 5 to 8, and 19

Claims 2 and 6 set forth a pH adjusting unit, which includes a pH adjusting part for a positive electrode and a pH adjusting part for a negative electrode. The pH adjusting unit is correspondingly the same as the pH level adjusting means disclosed in document D1, which appropriately controls the pH level of the electrolyte around the central electrode and the side electrode. Claim 5 sets forth a positive electrode chamber, a negative electrode chamber, and a power supply part, which correspond, respectively, to a positive electrode housing, a negative electrode housing, and a power supply device, which are disclosed in document D1. Thus, the invention as set forth in claim 5 is the same as the invention disclosed in document D1. Claims 7 and 8 set forth a pH sensor of the positive electrode chamber, a pH

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

sensor of the negative electrode chamber, and a solution supplier, which correspond to a pH level measuring means and a flow rate control means for electrolyte, which are disclosed in document D1. Thus, the invention as set forth in claims 7 and 8 is the same as the invention disclosed in document D1. In addition, claim 19 sets forth a plurality of electrokinetic units, a plurality of electrode units, and a parallel connection. Said feature is disclosed in document D1. Thus, all technical features of claims 2, 5 to 8, and 19 are disclosed in document D1. Accordingly, the invention as set forth in claims 2, 5 to 8, and 19 is not novel (PCT Article 33(2)).

2. Inventive Step

2.1 Claim 3

Claim 3 delimits a set value for adjusting the pH value. Said feature corresponds to a feature disclosed in document D2 in which a continual injection of an acetic acid solution is performed to delimit the pH of a positive electrode and the pH of a negative electrode to 5.0 or less. Accordingly, the invention as set forth in claim 5 could be easily derived from a combination of documents D1 and D2 by a person skilled in the art, and thus, does not involve an inventive step (PCT Article 33(3)).

2.2 Claim 4

Claim 4 sets forth that a nitric acid solution is used as a pH adjusting solution. However, document D3 discloses

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Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

that various types of acidic solutions including nitric acid, sulfuric acid, and acetic acid are used as pH adjusting solutions. Accordingly, the invention as set forth in claim 4 could be easily derived from a combination of documents D1 and D3 by a person skilled in the art, and thus, does not involve an inventive step (PCT Article 33(3)).

2.3 Claims 9 to 16

Claims 9 to 16 set forth: a waste liquid processing unit for removing metal oxide particles; a waste liquid circulator; a waste liquid circulating pump; a filter member; a soil cleansing unit; a precipitation separator unit; and a concentrating unit. Said features are technologies applied to an electrokinetic cleansing device disclosed in document D4 which includes: a storage tank for a cleansing agent; a storage tank for waste liquid from soil; a controlled volume pump; a filter paper plate; a filter steel plate; and a device for processing waste liquid from soil by removing metal materials and microparticles from the waste liquid. Accordingly, the invention as set forth in claims 9 to 16 could be easily derived from a combination of documents D1 and D4 by a person skilled in the art, and thus, does not involve an inventive step (PCT Article 33(3)).

2.4 Claims 17 and 18

Claim 17 sets forth an electrolyte supply amount adjusting part for automatically maintaining an electrolyte at a constant level, and claim 18 sets forth

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INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/KR2011/006861

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

a level detecting sensor and an opening and closing valve. Said features correspond to a level adjusting device disclosed in document D5 which maintains a positive electrode tank at a constant level during system operation. Accordingly, the invention as set forth in claims 17 and 18 could be easily derived from a combination of documents D1 and D5 by a person skilled in the art, and thus, does not involve an inventive step (PCT Article 33(3)).

3. Industrial Applicability

The invention as set forth in claims 1 to 19 is industrially applicable (PCT Article 33(4)).