**PATENT COOPERATION TREATY**

**PCT**

**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

<table>
<thead>
<tr>
<th>Applicant’s or agent’s file reference</th>
<th>FOR FURTHER ACTION</th>
<th>See item 4 below</th>
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<tr>
<td>FP5716</td>
<td>International filing date (day/month/year)</td>
<td>Priority date (day/month/year)</td>
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<tr>
<td>International application No. PCT/SG2012/000111</td>
<td>30 March 2012 (30.03.2012)</td>
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International Patent Classification (8th edition unless older edition indicated)

See relevant information in Form PCT/ISA/237

Applicant: TEMASEK POLYTECHNIC

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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).

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   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.

3. This report contains indications relating to the following items:

   - [X] Box No. I Basis of the report
   - [ ] 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
   - [X] Box No. V Reasoned statement under Article 35(2) 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

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).

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Date of issuance of this report
01 October 2014 (01.10.2014)

Authorized officer
Kihwan Moon

e-mail: pt01.pct@wipo.int

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

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Form PCT/IB/373 (January 2004)
From the:
INTERNATIONAL Searching AUTHORITY

To:
MARKS & CLERK SINGAPORE LLP
TANJONG PAGAR
PO BOX 636
SINGAPORE 910816

PCT
WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43bis.1)

Date of mailing
(day/month/year) 22 May 2012

FOR FURTHER ACTION
See paragraph 2 below

Applicant's or agent's file reference
FP5716

International application No.
PCT/SG2012/000111

International filing date (day/month/year)
30 March 2012

Priority date (day/month/year)
30 March 2012

International Patent Classification (IPC) or both national classification and IPC
Int. Cl.
H01M 8/04 (2006.01)

Applicant
TEMASEK POLYTECHNIC et al

1. This opinion contains indications relating to the following items:
   - [X] Box No. 1 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
   - [X] Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and 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(h) 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
AUSTRALIAN PATENT OFFICE
PO BOX 200, WODEN ACT 2606, AUSTRALIA
E-mail address: pct@ipaustralia.gov.au
Facsimile No. +61 2 6283 7999

Date of completion of this opinion
22 May 2012

Authorized Officer
PRAVEEN JAIN
AUSTRALIAN PATENT OFFICE
(ISO 9001 Quality Certified Service)
Telephone No. +61 2 6222 3653

Form PCT/ISA/237 (Cover sheet) (July 2011)
1. With regard to the **language**, this opinion has been established on the basis of:

- [x] 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 (under 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 43bis.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

**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

1. **Statement**

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<th>Novelty (N)</th>
<th>Claims</th>
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<th>Inventive step (IS)</th>
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<table>
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<tr>
<th>Industrial applicability (IA)</th>
<th>Claims</th>
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2. **Citations and explanations:**

The following documents identified in the International Search Report have been considered for the purposes of this report:

D1: US 2009/0068507 A1
D2: US 2007/0190374 A1
D3: US 7976992 B2
D4: WO 2011/051338 A1

**NOVELTY (N)**

Invention defined in claims 1 – 29 meets the criteria set forth in PCT Article 33(2) for novelty. The prior art published before the priority date does not disclose all the features of independent claims 1 and 15 especially the feature of a vessel coupled with a first outlet of reactant in a fuel cell assembly and forming dead-end, wherein the vessel return the reactant to the fuel cell assembly via first outlet when the supply of the first reactant to the fuel cell assembly is cut off.

**INVENTIVE STEP (IS)**

Claims 1 – 29 meet the criteria set out in PCT Article 33(3) with regard to the requirement of Inventive Step because the prior art does not obviously suggest to a person skilled in the art a vessel coupled with a first outlet of reactant in a fuel cell assembly and forming dead-end, wherein the vessel return the reactant to the fuel cell assembly via first outlet when the supply of the first reactant to the fuel cell assembly is cut off.

The claimed invention is not obvious in the light of any of the cited documents nor is it disclosed in any obvious combination of them. It is also considered that it would not be obvious to a person skilled in the art in the light of common general knowledge either by itself or in combination with any of these documents.

**INDUSTRIAL APPLICABILITY (IA)**

The invention defined in the claims is considered to meet the requirements of Industrial Applicability under Article 33(4) of the PCT because it can be made by, or used in, industry.