

PATENT COOPERATION TREATY
PCT
INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 504608	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. PCT/AU2006/000984	International filing date (<i>day/month/year</i>) 12 July 2006	Priority date (<i>day/month/year</i>) 12 July 2005
International Patent Classification (IPC) or national classification and IPC		
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Applicant COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION et al.		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
 - a. (*sent to the applicant and to the International Bureau*) a total of 5 sheets, as follows:
 - sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
 - sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
 - b. (*sent to the International Bureau only*) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or table related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:
 - 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
 - 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

Date of submission of the demand 14 May 2007	Date of completion of this report 23 October 2007
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Box No. I Basis of the report

1. With regard to the **language**, this report is based on:

The international application in the language in which it was filed

A translation of the international application into _____, which is the language of a

international search (under Rules 12.3(a) and 23.1 (b))

publication of the international application (under Rule 12.4(a))

international preliminary examination (Rules 55.2(a) and/or 55.3(a))

2. With regard to the **elements** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

the international application as originally filed/furnished

the description:

pages **1-13** as originally filed/furnished

pages* received by this Authority on _____ with the letter of _____

pages* received by this Authority on _____ with the letter of _____

the claims:

pages _____ as originally filed/furnished

pages* _____ as amended (together with any statement) under Article 19

pages* **14-18** received by this Authority on **27 July 2007** with the letter of **27 July 2007**

pages* received by this Authority on _____ with the letter of _____

the drawings:

pages **1/7-7/7** as originally filed/furnished

pages* received by this Authority on _____ with the letter of _____

pages* received by this Authority on _____ with the letter of _____

a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3. The amendments have resulted in the cancellation of:

the description, pages _____

the claims, Nos. 23

the drawings, sheets/figs _____

the sequence listing (*specify*): _____

any table(s) related to the sequence listing (*specify*): _____

4. This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

the description, pages _____

the claims, Nos. _____

the drawings, sheets/figs _____

the sequence listing (*specify*): _____

any table(s) related to the sequence listing (*specify*): _____

5. This report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to the Authority under Rule 91 (Rule 70.2(e)).

* If item 4 applies, some or all of those sheets may be marked "superseded."

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 1–22	YES
	Claims	NO
Inventive step (IS)	Claims	YES
	Claims 1–22	NO
Industrial applicability (IA)	Claims 1–22	YES
	Claims	NO

2. Citations and explanations (Rule 70.7)

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

D1: OSBORNE, Encyclopedia of Analytical Chemistry, Vol. 5, pages 4069–4082: discloses the use of near infrared (NIR) spectroscopy in food and beverage (section 5.7) analysis covering the wavelength range 780–2500 nm (Introduction), plus visible (VIS) and NIR covering wavelengths from 400 to 2500 nm (sections 2.1 and 2.2), using transmittance, reflectance and transreflectance techniques (sections 3.1–3.2), applying chemometric analysis to the resulting data (sections 4.1–4.4) and being applied to fluids such as milk (section 5.2), beer, wine, tea, coffee and fruit juices (section 5.7) with this data compared with reference data (section 5.8).

D2: COZZOLINO et al., Journal of Agricultural and Food Chemistry, 2003, Vol. 51, pages 7703–7708: discloses the use of VIS-NIR spectroscopy (abstract) for wavelengths of 400–2500 nm (page 7704, column 1) in transmission mode (page 7704, column 1), applying chemometric analysis to the resulting data (pages 7704–7707) and being applied to fluids such as white wine (abstract; page 7704).

D3: COZZOLINO et al., Analytica Chimica Acta 2004, Vol. 513, pages 73–80: discloses the use of VIS-NIR spectroscopy for wavelengths of 400–2500 nm (abstract, section 2.2) in transmittance mode (abstract, section 2.2) on fluid samples such as red wine (abstract, section 2.1) and applying chemometric analysis on the resulting data (sections 2.3 and 3).

D4: US 2004/022136 discloses the use of NIR spectroscopy for wavelengths of 700–2200 nm (claim 4) using transmittance, reflectance or transreflectance modes (paragraph 0012) applied to wine or coffee samples (abstract; paragraphs 0008, 0027–0033) and applying chemometric analysis on the resulting data (paragraphs 0036–0041, 0055–0073).

D5: OSBORNE et al., Practical NIR spectroscopy with applications in food and beverage analysis: discloses the use of NIR spectroscopy in food and beverage analysis (applications in chapter 8) with specific examples relating to wine quality being sucrose in wine (page 163), tartaric acid in wine (page 167) and alcohol in wine and (pages 168–169) using transmittance and transreflectance techniques.

D6: SKOUROUMOUNIS et al., Journal of Grape and Wine Research, Vol. 9, 2003, pages 138–148: discloses the use of visible light and ultra-violet spectroscopy at wavelengths of 420, 540 and 600 nm in absorbance mode (abstract, page 140) on fluid samples such as wine (introduction) in clear and coloured glass bottles (Introduction, page 140; table 1) showing the ability to extract information on oxidation of wine (abstract, pages 142–143 and 145–146)

Continued on an extra sheet

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box V

D7: US 540514 discloses the use of ultraviolet, visible and NIR spectroscopy (column 2, lines 42–50) for wavelengths between 200 nm and 10 cm (column 1, lines 63–66) in transmittance mode (figure 1; column 2, lines 50–59) on fluid samples such as lemonade, cola, fruit juice (column 1, line 20, column 3, lines 35–37) in bottles (figure 1; column 2, lines 51–55; column 3, lines 18–53).

D8: GB 2297377 discloses the use of NIR spectroscopy (abstract) for wavelengths between 780 and 2500 nm (page 2, line 2) in transmission mode for fluid samples such as liquid incendiaries and explosives and common alcoholic and non-alcoholic beverages (page 2, lines 3–4) in bottles (abstract; figure 1; page 1, lines 10–22; page 3, lines 5–6; page 4, lines 29–34).

It is considered that documents D1 and D5 may be used establish the common general knowledge. The person skilled in the art would be a group consisting of chemists specialising in the field of food technology and food technologists. These documents are parts of widely available text books published well before the priority date of the current application. The documents provide literature references in standard scientific journals as evidence for the information presented. It is considered that the person skilled in the art would be familiar with such standard text books and the references cited therein and would search for, and read, such references as part of their research activities. The common general knowledge is assumed to be that disclosed in D1 plus the specific measurements of wine quality disclosed in D5 which are not explicitly disclosed in D1.

If this argument for common general knowledge is not accepted an alternative inventive step argument is also presented after this first argument.

Novelty (N)

Claims 1, 19 and 20: The subject matter of these claims is considered to meet the criteria set forth in PCT Article 33(2) for novelty. The prior art published before the priority date does not disclose the use of VIS-NIR spectroscopy in transreflectance mode on a fluid in its original container.

Claims 2–18 and 21–12: These appended claims add further features to their respective independent claims are therefore also considered novel.

First approach (assuming information in D1 and D5 are common general knowledge):Inventive Step (IS)

Claims 1–6, 10–14, 17, 19 and 20: The claimed invention is considered to lack an inventive step with respect to combinations of any one of D6, D7 or D8 with common general knowledge (D1 and D5) for the reasons given above. The original container is a beverage container (D6: abstract; page 140 'Bottles'; tables 1–3; figures 2–6; Conclusion; D7: abstract; figure 1; D8: abstract; figure 1; page 1, lines 1–7).

Claims 7–8: The features added by this appended claim is considered not inventive based on combinations of any one of D6, D7 or D8 with common general knowledge (D1 and D5) for the reasons given above. The original container is a coloured or uncoloured and/or transparent glass bottle (D6: abstract; page 140 'Bottles'; tables 1–3; figures 2–6; Conclusion; D7: abstract; figure 1; D8: abstract; figure 1; page 1, lines 1–7), the original container is a wine bottle (D6: as above).

Claim 9: The features added by this appended claim are considered not inventive based on the combination of D7 with common general knowledge (D1 and D5). D1 discloses the VIS-NIR wavelengths are from 400 to 2500 nm (see above). D7 discloses that the VIS-NIR electromagnetic radiation be in the range between 200 nm and 10 cm (column 1, lines 63–66).

Continued on an extra sheet

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box V

Claims 15–16, 18 and 21–22: The features added by these appended claims are considered to lack an inventive step compared with the combination of the disclosures of any one of D2, D3 or D4 with common general knowledge (D1 and D5). For example:

- D2 discloses that the wine could be Riesling or chardonnay (page 7704 ‘Samples’),
- D2 discloses the following indicators of wine quality (alcohol, SO₂, glucose and fructose (table 1),
- D2 discloses the use of Principal Component Analysis (PCA; page 7704 ‘Data Analysis and Interpretation’) and partial least squares (DPLS; page 7704 ‘Data Analysis and Interpretation’),
- D3 discloses that the wine could be cabernet sauvignon or shiraz (section 2.1),
- D3 discloses the following indicators of wine quality: malvidin-3-glucoside, pigmented polymers and tannins (tables 1–3) alcohol and sugar (page 77),
- D3 discloses the use of Principal Component Analysis (PCA; section 2.3),
- D4 discloses that the wine could be cabernet sauvignon (figure 7),
- D4 discloses the use of Principal Component Analysis (PCA; paragraph 0039) and Partial Least Squares (PLS; paragraph 0039).

Alternative approach (if information in D1 and D5 are not considered common general knowledge):

Inventive Step (IS)

Claims 1–6, 10–14, 17, 19 and 20: The claimed invention is considered to lack an inventive step with respect to combinations of any one of D6, D7 or D8 with D1 or the reasons given above. The original container is a beverage container (D6: abstract; page 140. ‘Bottles’; tables 1–3; figures 2–6; Conclusion; D7: abstract; figure 1; D8: abstract; figure 1; page 1, lines 1–7).

Claims 7–8: The features added by these appended claims are not given by D1 and so are considered novel with respect to D1. D6, D7 and D8 each disclose that the original container should be a bottle and D8 that it should be a wine bottle as explained above. The problem being addressed is obtaining data from fluids inside their original bottles, it would have been obvious to one skilled in the art to search in the area of visible and NIR spectroscopy and so find and combine the teaching of D1 with that of each one of D6, D7 and D8. These citations do not individually disclose all the features of these claims, but when combined, as would be obvious to a person skilled in the art, disclose all the features of the claims.

Claims 9, 15–16, 18 and 21–22: The features added by these appended claims are not given by D1 and so are considered novel with respect to D1. However, these features are considered not inventive being disclosed by the combination of D1 with one of D2, D3, D4 or D7. For example: D7 discloses that the VIS-NIR electromagnetic radiation be in the range between 200 nm and 10 cm (column 1, lines 63–66), while D2, D3 and D4 disclose the features listed above under the first approach. The problem being addressed is obtaining data from fluids, particularly wine, using VIS-NIR spectroscopy it would have been obvious to one skilled in the art to search in the area of VIS-NIR spectroscopy and so find and combine the teaching of D1 with that of one of D2, D3, D3 or D7. These citations do not individually disclose all the features of these claims, but when combined, as would be obvious to a person skilled in the art, disclose all the features of the claims.

Industrial Applicability (IA)

The claims are related to products capable of industrial application.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method of assessing at least one characteristic of a fluid held in an original container utilizing visible-near infrared (VIS-NIR) spectroscopy, the method comprising:
 - 5 subjecting at least a part of the fluid in the container to VIS-NIR electromagnetic radiation;
 - obtaining at least a part of the VIS-NIR transmittance spectra of the fluid;
 - and
 - correlating at least a part of the spectra obtained with a reference data set
 - 10 utilizing chemometric analysis to assess at least one characteristic of the fluid.
2. The method according to claim 1, wherein the transmittance spectra is obtained by transmitting electromagnetic radiation through the fluid, reflecting at least a part of the transmission spectra using a suitable reflecting surface and retransmitting through the fluid before being detected by the detector.
- 15 3. The method according to claim 1 or claim 2, wherein assessment is quantitative or qualitative and/or both.
- 20 4. The method according to any one of the preceding claims, further comprising performing chemometric analysis of the obtained VIS-NIR reflectance spectra.
5. The method according to any one of the preceding claims, wherein the container has at least one area which is substantially transparent to VIS-NIR electromagnetic radiation at the wavelength used to perform the analysis.
- 25 6. The method according to any one of the preceding claims, wherein the original container is a beverage container.
- 30 7. The method according to claim 6, wherein the beverage container is a coloured or uncoloured and/or transparent glass bottle.
8. The method according to claim 7, wherein the glass bottle is a wine bottle.

9. The method according to any one of the preceding claims, wherein the VIS-NIR electromagnetic radiation used is in the range between about 350 and about 1100 nm.
- 5 10. The method according to any one of the preceding claims, wherein the fluid is a beverage.
11. The method according to claim 10, wherein the beverage is an alcoholic beverage.
- 10 12. The method according to claim 11, wherein the alcoholic beverage is a fermented beverage.
13. The method according to claim 12, wherein the fermented beverage is selected
15 from the group comprising beer, ale, spirits, wine, sparkling wines and mixtures thereof.
14. The method according to claim 13, wherein the fermented beverage is a wine or wine product.
- 20 15. The method according to claim 14, wherein the wine is selected from the group comprising a "red" wine or a "white" wine, sparkling, rose and/or a fortified wine.
- 25 16. The method according to claim 15, wherein the wine is selected from group comprising Riesling; Traminer; Frontignac; Sauvignon Blanc; Verdelho; Semillon; Pinot Noir; Cabernet Franc; Chenin Blanc; Chardonnay; Chambourcin; Merlot; Shiraz; Cabernet Sauvignon; and Grenache; and blends thereof.
- 30 17. The method according to any one of the preceding claims, wherein the at least one characteristic of the fluid assessed is selected from one or more of the group comprising: quality, pigments selected from the group comprising yellow, orange, brown and red, sugars, pH, total acidity, volatile acidity, density,
35 specific gravity, degree of fermentation, spirit indication (alcohol), sensory characteristics (e.g. oxidation or browning), free and total sulphur dioxide

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concentration, and / or other characteristics that is indicative of wine quality value.

18. The method according to claim 17, wherein the fluid is wine and the characteristics that are indicative of wine quality include any one or more from the group comprising: galacturonic acid; gums; polysaccharides of arabinose and galactose; tartaric acid; malic acid; citric acid; succinic acid; lactic acid; acetic acid; potassium bitartrate; formic; organic acids such as; oxalic acid; pyruvic acid; butyric acid; iso-butyric acid; hexanoic acid; octanoic acid; Ketoglutaric acid; alcohols such as; ethanol; methanol; isopropanol; n-butanol; isobutanol; n-amyl alcohol; 3-methylbutanol; 2-methylbutanol; n-hexanol; 2-phenylethanol; polyalcohol (polyols) such as ; 2,3-butandiol; glycerol; erythritol; xylitol; arabitol (also called arabinitol); mannitol; acetaldehyde; acetoin and diacetyl; acetate; butyrate; oxanoate and other esters; ethyl acetate; ethyl formate; propyl acetate; isopropyl acetate; isobutyl acetate; isoamyl acetate; phenylethyl acetate; Esters such as; methyl ester n-propanol ethyl propionate; ethyl valerate; ethyl hexanoate (caproate); ethyl octanoate (caprylate); ethyl decanoate (caprate); ethyl lactate; ethyl succinate (acidic ester); methyl o-anthranilate; amino acids; diammonium phosphate; proteins; nitrates; amino acid esters; vitamins; biotin; choline; gallic acid; coumaric acid; caftaric acid; fertaric acid; catechin; epicatechin; epicatechin gallate; procyanidin (B1, B2, B3); catechin gallate; hydroxycinnamic acid esters (coumaric, caftaric, fertaric); acids; glutathionyl caftaric acid; catechin + epicatechin; afzelechin; epigallocatechin; flavane (3,4) diol; flavonol-3; potassium; sodium; calcium; iron; lithium; magnesium; copper; lead; manganese; aluminium; zinc; rubidium; arsenic; nickel; anions; phosphate; sulfate; borates; silicates; halogens; fatty acids; boron; fluorine; silicon; phosphate; sulphate; chlorine; bromine; iodine; anions, sulphur dioxide; acetaldehyde-bisulfite (bound SO₂); fumaric acid; vinylbenzene; benzaldehyde; nonalactone; ethyl phenylacetate; p-hydroxybenzoic acid; p-pyrocatechuic acid; gallic acid; vanillic acid; syringic acid; salicylic acid; o-pyrocatechuic acid; gentisic acid; cinnamic acid; p-coumaric acid; caffeic acid; ferulic acid; sinapic acid; coumaric acid; caftaric acid; fertaric acid; digallic acid; ellagic acid; flavonoids; afzelechin; glycosides; tannins; flavylum ion; anthocyanins; cyanidin; delphinidin; peonidin; petunidin; malvidin; ethyl acetate; ethyl caproate; terpenoids; pyrazines; phenolics; chlorogenic acid; methyl

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- anthranilate; ethyl anthranilate; methyl salicylate; ethyl salicylate; 2-methoxymethyl benzoate; 2 methoxyethyl benzoate; ethyl trans-2-butenolate; ethyltrans-2-hexenoate; ethyl trans-2 octenoate; ethyl trans-2-decenoate; ethyl trans-trans-2,4 decadienoate; ethyl trans-cis-2,4-decadienoate; ethyl trans,trans,cis-2,4,7-decatrienoate; ethyl trans,cis-2,6 dodecadienoate; methyl 3-hydroxybutanoate; 3-hydroxybutanoate; ethyl 3 hydroxyhexanoate; damascenone; furaneol; methoxyfuraneol; ethyl 3 mercaptopropanoate; trans-2-hexen-1-ol; hydrogen disulfide; carbon disulfide; dimethyl disulfide; dimethyl sulfide; diethyl sulfide; diethyl disulfide; methanethiol; ethanethiol; dimethyl sulfoxide; methyl thiolacetate; ethyl thiolacetate; cis and trans-2-methylthiophan-3-ol; 5- [hydroxyethyl]-4-methylthiazole; thio aliphatic alcohols; methionol or 3- (methylthio)-propanol; polyphenol oxidases; laccase; chlorogenic acid; protocatechuic acid; glutathione; 2-S-glutathionylcaftaric acid; acetaldehyde; 13-C-Norisoprenoids; 1,1,6-trimethyl 1,2-dihydronaphthalene(TDN); vitispirane; lignins; gallic acid; aromatic aldehydes; vanillin; syring aldehyde; coniferyaldehyde; sinapaldehyde; maltol; cyclotene; ethoxylactone; furfural; furfuryl alcohol; guaiacol; geosmin; malvidin glucoside; quinones; tartaric acid; potassium bitartrate; calcium tartrate; calcium carbonate; sorbic acid; ethyl sorbate; benzoic acid and sodium benzoate; diethyl dicarbonate(DEDC); dimethyl dicarbonate(DMDC); hydrogen sulfide; mercaptan; diethyl sulfide; ethyl mercaptan; pH, diacetyl, acetoin, 2,3-butandiol; 2-ethoxyhexa-3,5-diene; histamine; tyramine; putrescine; cadaverine; ethyl carbamate; urea, carbamyl phosphate or combinations thereof.
19. A method for determining the response of a visible-near infrared (VIS-NIR) analyser(s) for one or more characteristic(s) of a fluid held in an original container comprising:
for each characteristic(s) of interest, providing a database or library, by analysing a series of samples using standard laboratory techniques and correlating the results with their VIS-NIR transfectance spectra,
utilizing the database or library to establish a chemometric model for the characteristic(s).
20. A chemometric model for at least one characteristic of a wine or wine product held in an original container, the chemometric model produced by

subjecting at least part of a wine or wine product held in the container to
VIS-NIR electromagnetic radiation;

obtaining at least part of the VIS-NIR transfectance spectra of the wine or
wine product;

5 correlating the spectra obtained to reference analytical data utilizing
chemometric analysis of the spectral data.

21. The chemometric model according to claim 20, wherein the chemometric
analysis is based on eigenvalue decomposition of the experimental data.

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22. The chemometric model according to claim 21, wherein the eigenvalue
decomposition utilizes principal component analysis (PCA) and partial least
squares in latent variables (PLS).

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