

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Pascal Technologies,
Petitioner

v.

Cambridge Enterprise Limited, Universitat Politècnica de Catalunya and
Universitat de Barcelona,
Patent Owner

Case No. IPR2024-01235
Patent 11,230,656

DECLARATION OF SYLVIA D. HALL-ELLIS, PH.D.

I. INTRODUCTION

1. My name is Sylvia D. Hall-Ellis. I have been retained as an expert by Petitioner Pascal Technologies.

2. I have written this report at the request of Petitioner to provide my expert opinion regarding the authenticity and public availability of a publication. My report sets forth my opinions in detail and provides the basis for my opinions regarding the public availability of this publication.

3. I reserve the right to supplement or amend my opinions, and basis for them, in response to any additional evidence, testimony, discovery, argument, and/or other additional information that may be provided to me after the date of this report.

4. I am being compensated for my time spent working on this matter at my normal consulting rate of \$400 per hour, plus reimbursement for any additional reasonable expenses. My compensation is not in any way tied to the content of this report, the substance of my opinions, or the outcome of this litigation. I have no other interest in this proceeding or with any of the parties.

5. All of the materials that I considered are discussed explicitly in this declaration.

II. QUALIFICATIONS

6. I am currently an Adjunct Professor in the School of Information at San José State University. I obtained a Master of Library Science from the University of North Texas in 1972 and a Ph.D. in Library and Information Science from the University of Pittsburgh in 1985. Over the last fifty-five years, I have held various positions in the field of library and information resources. I was first employed as a librarian in 1966 and have been involved in the field of library sciences since, holding numerous positions.

7. I am a member of the American Library Association (ALA) and its Association for Library Collections & Technical Services (ALCTS) Division (now known as CORE), and I served on the Committee on Cataloging: Resource and Description (which wrote the new cataloging rules) and as the chair of the Committee for Education and Training of Catalogers and the Competencies and Education for a Career in Cataloging Interest Group. I also served as the Chair of the ALCTS Division's Task Force on Competencies and Education for a Career in Cataloging. Additionally, I have served as the Chair for the ALA Office of Diversity's Committee on Diversity, as a member of the national Board of Directors for REFORMA, as a member of the Editorial Board for the ALCTS premier cataloging journal, *Library Resources and Technical Services*, a member of the Membership Committee for the Library Research Round Table (LRRT) of

the American Library Association, and a member of the LRRT Nominating Committee. Currently I serve as a member of the CORE Margaret Mann Citation Committee.

8. I have also given over one hundred presentations in the field, including several on library cataloging systems and Machine-Readable Cataloging (“MARC”) standards. My current research interests include library cataloging systems, metadata, and organization of electronic resources.

9. My full curriculum vitae is attached hereto as Appendix A to this report.

III. PRELIMINARIES

A. Scope of Declaration and Legal Standards

10. I am not an attorney and will not offer opinions on the law. I am, however, rendering my expert opinion on the authenticity of the documents referenced herein and when and how each of these documents was disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art, exercising reasonable diligence, could have located the documents before October 14, 2016.

11. I am informed by counsel that a printed publication qualifies as publicly accessible as of the date it was disseminated or otherwise made available such that a person interested in and ordinarily skilled in the relevant subject matter

could locate it through the exercise of ordinary diligence.

12. While I understand that the determination of public accessibility under the foregoing standard rests on a case-by-case analysis of the facts particular to an individual publication, I also understand that a printed publication is rendered “publicly accessible” if it is cataloged and indexed by a library such that a person interested in the relevant subject matter could locate it exercising reasonable diligence (*i.e.*, I understand that cataloging and indexing by a library in a manner that permits a person of ordinary skill in the relevant subject matter to locate the publication is sufficient, though there are other ways that a printed publication may qualify as publicly accessible). One manner of sufficient indexing is indexing according to subject matter category. I understand that the cataloging and indexing by a single library of a single instance of a particular printed publication is sufficient, even if the single library is in a foreign country. I understand that, even if access to a library is restricted, a printed publication that has been cataloged and indexed therein is publicly accessible so long as a presumption is raised that the portion of the public concerned with the relevant subject matter would know of the printed publication. I also understand that the cataloging and indexing of information that would guide a person interested in the relevant subject matter to the printed publication, such as the cataloging and indexing of an abstract for the printed publication, is sufficient to render the printed publication publicly

accessible.

13. I understand that routine business practices, such as general library cataloging and indexing practices, can be used to establish an approximate date on which a printed publication became publicly accessible.

B. Persons of ordinary skill in the art

14. I am told by counsel that the subject matter of this proceeding relates generally to the identification and use of organic caloric materials, specifically organic barocaloric materials, in refrigeration methods and apparatus.

15. I have been informed by counsel that a “person of ordinary skill in the art at the time of the invention” (POSITA) is a hypothetical person who is presumed to be familiar with the relevant field and its literature at the time of the inventions. This hypothetical person is also a person of ordinary creativity, capable of understanding the scientific principles applicable to the pertinent field.

16. I am told by counsel that persons of ordinary skill in this subject matter or art would have had a Bachelor’s degree in chemical engineering, chemistry, materials science engineering (or a related or equivalent field), and two or more years of experience identifying, researching, developing, designing and/or evaluating (or supervising the same) caloric materials, including the effects and use thereof as well as systems supporting and exploring the effects and use of caloric materials. A person with less or different education but more relevant practical

experience, or vice versa, may also meet this standard. Each of these POSITAs may be part of an interdisciplinary team with others having the relevant experience set forth above.

17. It is my opinion that such a person would have been engaged in research, learning through study and practice in the field and possibly through formal instruction the bibliographic resources relevant to his or her research. Before October 14, 2016, such a person would have had access to an array of long-established print resources in the identification and use of caloric materials, including both inorganic and organic barocaloric materials, and systems and methods involving the use of inorganic and organic barocaloric materials in heating and cooling applications.

18. Based on my experience working in research libraries with researchers having the qualifications described above, or even lesser qualifications, it is my opinion that such researchers would have been able to locate the material discussed herein on their own or with the assistance of a research librarian with relative ease using the tools and resources described herein.

IV. INFORMATION SEEKING PRACTICES

19. In preparing this declaration, I used authoritative databases, such as the OCLC bibliographic database, the Library of Congress Online Catalog, and the Library of Congress Subject Authorities, to confirm citation details of the various

publications discussed. Unless I note otherwise below in reference to a specific serial publication, it is my expert opinion that this standard protocol was followed for the serial publication discussed below.

20. Based on my experience working in research libraries with researchers having the qualifications described above, or even lesser qualifications, it is my opinion that such researchers would have been able to locate the material discussed herein on their own or with the assistance of a research librarian with relative ease using the tools and resources described herein.

A. INDEXING

21. A researcher may discover material relevant to his or her topic in a variety of ways. One common means of discovery is to search for relevant information in an index of periodical and other publications. Having found relevant material, the researcher will then normally obtain it online, look for it in libraries, or purchase it from a publisher, a bookstore, a document delivery service, or other provider. Sometimes, the date of a document's public accessibility will involve both indexing and library date information. However, date information for indexing entries is often unavailable. This is especially true for online indices.

22. Indexing services use a wide variety of controlled vocabularies to provide subject access and other means of discovering the content of documents. The formats in which these access terms are presented vary from service to service.

23. Online indexing services commonly provide bibliographic information, abstracts, and full-text copies of the indexed publications, along with a list of the documents cited in the indexed publication. These services also often provide lists of publications that cite a given document. A citation of a document is evidence that the document was publicly available and in use by researchers no later than the publication date of the citing document.

24. Before the widespread development of online databases to index articles in journals, magazines, conference papers, and technical reports, libraries purchased printed volumes of indices. Graduate library school education mandated that students learn about the bibliographic control of disciplines, the prominent indexing volumes, and searching strategies required to use them effectively and efficiently. Half of the courses that I studied in library school were focused on bibliography and resources in academic disciplines.

25. Librarians consulted with information seekers to verify citations, check availability in union catalogs, printed books catalogs, the OCLC database, and make formal requests for materials (e.g., books, conference proceedings, journal articles). Requests were transmitted using Telex machines, rudimentary email systems, and the United States Postal Service. During my career, I have performed and supervised staff who handled these resource sharing tasks.

26. A major firm known for the breadth of subjects and comprehensive

treatment in the preparation of index volumes, the H. W. Wilson Company offered these reference resources since the firm was founded in 1898. The *Reader's Guide to Periodical Literature* is one of the best-known titles available from H. W. Wilson. Each volume includes a comprehensive index for 300 of the most popular and important periodicals published in the United States and Canada. Information seekers have subject access expressed in plain language terminology, author access, and cross references to find the desired results from their searches. The family of index titles included *Science & Technology Index*, *Business Periodicals*, *Applied Science & Technology Index*, *Humanities Index*, *Biological & Agricultural Index*, and *Industrial Arts Index*. These printed indices have been superseded by digital database offerings available to information seekers through Ebsco.

27. Online indexing services such as Google Scholar¹ or ScienceDirect² commonly provide bibliographic information, abstracts, and full-text copies of the indexed publications, along with a list of the documents cited in the indexed publication. These services also often provide lists of publications that cite a given document.

28. A researcher may discover material relevant to his or her topic in a variety of ways. A citation of a document by another is evidence that the document

¹ Attachment 2, <https://scholar.google.com/>

² Attachment 3, <https://www.sciencedirect.com/>

was publicly available and in use no later than the publication date of the citing document. One common means of discovery is to search for relevant information in an index of periodicals and other publications. Having found relevant material, the researcher will then normally obtain it online, look for it in libraries, or purchase it from a publisher, a bookstore, a document delivery service, or other provider. Sometimes, the date of a document's public accessibility will involve both indexing and library date information. However, date information for indexing entries is often unavailable. This is especially true for online indices.

29. Indexing services use a wide variety of controlled vocabularies to provide subject access and other means of discovering the content of documents. The Library of Congress Subject Authorities includes standard forms of terms and cross references that are included in bibliographic records. Subject headings are terms that an individual seeking a document regardless of format can enter in the search bar of the online catalog. Subjects also connect an authenticated term (one included in the Library of Congress subject headings list) with related, broader, and narrower terms. The formats in which these access terms are presented vary from service to service.

30. Online indexing services commonly provide bibliographic information, abstracts, and full-text copies of the indexed publications, along with a list of the documents cited in the indexed publication. These services also often

provide lists of publications that cite a given document. A citation of a document is evidence that the document was publicly available and in use by researchers no later than the publication date of the citing document. Prominent indexing services include *Scopus*, the *IEEE Xplore* database, the *ACM Digital Library*, *Google Scholar*, and the *Internet Archive*.

V. PUBLICATION

A. Document 1: Exhibit 1101 (“Pol Català”)

31. Attached hereto as Exhibit 1101 is a copy of a bachelor’s thesis titled *Efectes Barocalòrics en Cristalls Plastics* by Núria Pol Català (hereafter “Pol Català”) written in Catalan and published in 2016. Exhibit 1101 is a true and correct copy of the title page, summary (“resume”), table of contents (“Índex”), glossary “Glossari”), text, acknowledgements (“Agraïments”), bibliography (“Bibliografia”), and two appendices. The title page shows a June 2016 date. The thesis is an open access document and can be downloaded from the Catàleg Collectiu de les Universitats de Catalunya³ and from the UP Commons digital repository through the Universitat Politècnica de Catalunya Library.⁴ The thesis

³ Attachment 4,

https://ccuc.csuc.cat/discovery/search?vid=34CSUC_NETWORK:CSUC_CCUC_UNION.

⁴ Attachment 5, <https://upcommons.upc.edu/handle/2117/99255>.

was reviewed and approved by the thesis supervisor or supervisors.⁵ Following supervisor approval, the defense of this thesis was then “assessed in a public session in which the student gives an oral presentation and defends their thesis” before the examination committee. *Id.* The “examination committee [was] composed of the thesis supervisor or tutor and two members of the School’s academic staff.” *Id.* There are no indications that the thesis or its defense were subject to confidentiality restrictions.

32. I downloaded the Pol Català thesis from the UP Commons digital repository. Specifically, the text is complete; no pages are missing, and the text on each page appears to flow seamlessly from one page to the next; further, there are no visible alterations to the document. Exhibit 1101 was found within the custody of the custodian to whom the author granted permission to make copies and reproductions. Exhibit 1101 is a true and correct copy in a condition that creates no suspicion about its authenticity.

33. Attached hereto as Attachment 1A is a true and correct copy of the metadata record for this thesis from the online catalog record for this dissertation from the Catàleg Collectiu de les Universitats de Catalunya. The metadata record is presented in the Dublin Core schema⁶ and includes the following data elements:

⁵ Attachment 6, <https://etseib.upc.edu/en/Academic%20programmes/treballs-fi-destudis/bachelors-theses>.

⁶ Attachment 7, <https://www.dublincore.org/schemas/>.

(a) title (“Efectes barocalòrics en cristalls plastic”), (b) creator/author (“Pol Català, Núria”), (c) faculty advisors/contributors (“Tamarit Mur, José Luis” and “Lloveras Muntané, Pol Marcel”), (d) degree granting institution/contributor (“Universitat Politècnica de Catalunya. Departament de Física”), (e) five subjects (“Àrea temàtica UPC: Enginyeria dels materials; Refrigeració, Sistemes de – Materials; Cristalls plastics; Hidrostàtica; and, Entropia”); and, (f) the creation date (“2016-06-23”). The metadata record indicates that the Pol Català thesis can be viewed and downloaded from the Catàleg Collectiu de les Universitats de Catalunya. The “date issued” is the date of formal issuance of the resource.⁷ This is the publication date. The UP Commons website indicates a June 23, 2016, publication date. I personally identified and retrieved the library catalog record which is Attachment 1A.

34. The Universitats de Catalunya released all of the bachelor theses for members of the graduating class on that day (June 23, 2016). An information seeker (POSITA) can also browse the collection for the School of Engineering and Industrial technologies by year. The Pol Català thesis is included in the

⁷ Attachment 8, <https://www.dublincore.org/specifications/dublin-core/dcmi-terms/terms/issued/>.

alphabetical list for students graduating in June 2016.⁸ The page is not in the WayBack Machine because it is current and present on the Internet. Clicking on the name (“Pol Català, Núria”) takes the information seeker to the entry for her thesis⁹ in the UP Commons digital repository.

35. Attached hereto as Attachment 1B is a true and correct copy of the MARC record for the Pol Català thesis obtained from the OCLC bibliographic database. I personally identified and retrieved the MARC record that is Attachment 1B. As previously noted, the library that created the record is recorded in field 040 with a unique library code. For Attachment 1B, that library code is “ESCGB,” which means that the MARC record for this thesis was created at the Catàleg Collectiu de les Universitats de Catalunya (as part of a batchload of MARC records into the OCLC bibliographic database). The field 008 entry (“date entered on file”) indicates that the batchload was contributed to the OCLC bibliographic database on January 17, 2017 (“170117”). As can be seen in the field 008, a cataloger at the Catàleg Collectiu de les Universitats de Catalunya created

⁸ Attachment 9,

https://upcommons.upc.edu/handle/2099.1/21110/browse?rpp=20&offset=160&etal=-1&sort_by=-1&type=author&starts_with=P&order=ASC.

⁹ Attachment 10,

<https://upcommons.upc.edu/handle/2099.1/21110/browse?type=author&value=Pol+Catal%C3%A0%2C+N%C3%BAria>.

OCLC record number 1120476252 on June 23, 2016.

36. Attachment 1B includes four descriptor terms reading “Refrigeració, Sistemes de – Materials;” “Cristalls plastics;” “Hidrostatica;” and, “Entropia”); in the 650 fields. Thus, as of its cataloging, the publication corresponding to the MARC record attached hereto as Attachment 1B was indexed according to its subject matter by the field 650 entries. Further, as of June 23, 2016, the MARC record attached hereto as Attachment 1B was accessible through any library with access to the OCLC bibliographic database or through an individual library.

37. Attachment 1B indicates that the Pol Català thesis as cataloged at the Catàleg Collectiu de les Universitats de Catalunya is currently available from that institution and at the website included in field 856. In view of above, this thesis was publicly available on June 23, 2016, because by that date it had been received, cataloged, and indexed at the Catàleg Collectiu de les Universitats de Catalunya, placed in the custody of UP Commons digital repository through the Universitat Politècnica de Catalunya Library, and made part of the OCLC bibliographic database. The date of creation and addition to the UP Commons is June 23, 2016, and includes the Pol Català thesis and the theses of her classmates who graduated at the end of the Spring 2016 term. For these reasons, it is my opinion that Exhibit 1101 was published and accessible to the public no later than June 23, 2016.

VI. SUMMARY OF OPINIONS

38. In view of the foregoing, it is my opinion that the publication described above was publicly available on or about the corresponding date listed in the table below:

Document	Publication	Publicly Available
Exhibit 1101	Pol Català, Núria. <i>Efectes Barocalòrics en Cristalls Plàstics</i> . Treball de Fi de Grau, Grau en Enginyeria en Tecnologies Industrials, Universitat Politècnica de Catalunya, June 23, 2016. Barcelona, Spain: Universitat Politècnica de Catalunya, 2016.	June 23, 2016

39. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1029 of Title 18 of the United States Code.

Dated: July 29, 2024

Respectfully submitted,



Sylvia D. Hall-Ellis, Ph.D.

ATTACHMENT 1A

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  <dc:creator>Pol Català, Núria</dc:creator>
  <dc:contributor>Tamarit Mur, José Luis</dc:contributor>
  <dc:contributor>Lloveras Muntané, Pol Marcel</dc:contributor>
  <dc:contributor>Universitat Politècnica de Catalunya. Departament de Física</dc:contributor>
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  <dc:subject>Refrigeració, Sistemes de -- Materials</dc:subject>
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  <dc:subject>Hidrostatica</dc:subject>
  <dc:subject>Entropia</dc:subject>
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  <dc:subject xsi:type="dcterms:LCSH">Entropy</dc:subject>
  <dcterms:abstract>En aquest moment la majoria de sistemes de refrigeració funcionen per cicles
de refrigeració per
compressió de gasos. Els gasos que s'utilitzen són substàncies tòxiques o que participen en
l'efecte hivernacle en el cas que es produeixen fuites o es realitza una mala gestió dels residus.
Aquesta situació ha motivat la recerca de noves tècniques o materials per tal de millorar el
panorama actual. Durant les últimes dècades s'ha fet un pas important en l'estudi de materials
que mantenint-se a la fase sòlida aporten efectes calòrics, tot i que els resultats encara no es
poden equiparar als refrigerants actuals per compressió de gasos. En l'estat sòlid s'esperen
efectes calòrics gegants, per aplicació d'un camp extern, al voltant de transicions de fase de
primer ordre amb una gran calor latent associada.
En aquest projecte s'han estudiat els efectes calòrics induïts per l'aplicació de pressió hidrostàtica
(efectes barocalòrics o BCE). La investigació s'ha focalitzat en uns materials anomenats cristalls
plàstics perquè presenten una transició molt energètica degut a una transformació d'una fase
d'alta temperatura sòlida plàstica (amb desordre orientacional) a una fase de baixa temperatura
completament ordenada. En concret, s'han analitzat el Tris(hydroxymethyl)aminomethane (TRIS)
i el 2,2-Dimethyl-1-propanol-99% (NPA). Per a aquest estudi experimental, s'ha emprat
calorimetria diferencial (DSC) a pressió atmosfèrica i anàlisi tèrmic diferencial (DTA) a alta
pressió, que permeten obtenir mesures quasi-directes de l'efecte barocalòric, específicament de
la
variació d'entropia en un procés isoterm de canvi de pressió.
Els resultats mostren unes temperatures de transició a pressió atmosfèrica de 405 K pel TRIS i
246 K per l'NPA (en l'escalfament) i uns efectes barocalòrics convencionals de  $\Delta s = 673$ 
J/(K·kg) a pressió 2,1 kbar pel TRIS i de 200 J/(K·kg) a 2,2 kbar per l'NPA que superen amb
escreix (amb un factor de quasi 11 i 3, respectivament) els BCE gegants més grans analitzats fins
ara en l'estat sòlid. D'altra banda els valors obtinguts de la capacitat refrigerant a les mateixes
pressions són de 4420 J/kg pel TRIS i 9030 J/kg per l'NPA. No obstant, el BCE en el TRIS és
irreversible en el rang de pressions estudiat degut a la presència d'una gran histèresi, del voltant
de 60 graus. En el cas de l'NPA, tot i que també presenta una histèresi notable (30-35 graus), el
desplaçament de la temperatura amb la pressió és prou gran ( $dT/dp = 22$  K/kbar) per començar a
donar efectes barocalòrics reversibles a partir de 1,7 kbar. Amb aquests resultats es demostra que
l'NPA disposa de millors propietats per el funcionament d'una màquina cíclica de refrigeració per

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compressió que el TRIS.</dcterms:abstract>
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<dcterms:mediator>Escola Tècnica Superior d'Enginyeria Industrial de
Barcelona</dcterms:mediator>
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<discovery:resourceType>TFE</discovery:resourceType>

ATTACHMENT 1B

Bibliographic Record - OCLC Number: 1120476252

LDR	Record Status	'c' - Corrected or revised
	Type of Record	'a' - Language material
	Bibliographic Level	'm' - Monograph/Item
	Type of Control	' ' - No specified type of control
	Encoding Level	'M' - Added from a batch process
	Descriptive Cataloging Form	'i' - ISBD punctuation included
001	1120476252	
005	20240202180208.2	
008	Date Entered on File	'170117'
	Type of Date/Publication Status	's' - Single date
	Date1/Beginning Date of Publication	'2016'
	Date2/Ending Date of Publication	' '
	Place of Publication, Production, or Execution Code	'xx' - No place, unknown, or undetermined
	Illustrations	' '
	Target Audience	'f' - Specialized
	Form of Item	'o' - Online
	Nature of Contents Code	'm' -
	Government Publication	' ' - Not a government publication
	Conference Publication	'0' - Not a conference publication
	Festschrift	'0' - Not a festschrift
	Index	'0' - No index
	Literary Form	'0' - Not fiction
	Biography	' ' - No biographical material
	Language Code	'cat' - Catalan
	Modified Record	' ' - Record is not modified
	Cataloging Source Code	'd' - Other
006	Form of Material	'm' - Computer file
	Target Audience	' ' - Unknown or unspecified
	Form of Item	' ' - None of the following
	Type of Computer File	'd' - Document
	Government Publication	' ' - Not a government publication
007	Category of Resource	'c' - Electronic Resource
	Specific Material Designation (c)	'r' - Remote
	Color (c)	' ' - No attempt to code
	Dimensions (c)	' ' - No attempt to code
	Sound (c)	' ' - No attempt to code
	Image Bit Depth (c)	' '
	File Formats (c)	' ' - No attempt to code
	Quality Assurance Target(s) (c)	' ' - No attempt to code
	Antecedent/Source (c)	' ' - No attempt to code
	Level of Compression (c)	' ' - No attempt to code
	Reformatting Quality (c)	' ' - No attempt to code

- 040 ESCGB \$b cat \$e rda \$c ESCGB \$d OCLCQ \$d OCLCL
- 066 \$c (S
- 100 1 Pol Català, Núria, \$e autor.
- 245 1 0 Efectes barocalòrics en cristalls plàstics.
- 264 0 \$c 2016
- 300 1 recurs en línia (1 recurs en línia)
- 336 text \$b txt \$2 rdacontent/cat
- 337 informàtic \$b c \$2 rdamedia/cat
- 338 recurs en línia \$b cr \$2 rdacarrier/cat
- 500 Unitat responsable del treball: Universitat Politècnica de Catalunya. Departament de Física.
- 502 \$g Treball final \$b Grau (Grau en Enginyeria en Tecnologies Industrials) \$c Universitat Politècnica de Catalunya. Escola Tècnica Superior d'Enginyeria Industrial de Barcelona \$d 2016.
- 588 Descripció del recurs: 13 de gener de 2017.
- 520 \$6 520-00/(S \$a En aquest moment la majoria de sistemes de refrigeració funcionen per cicles de refrigeració per compressió de gasos. Els gasos que s'utilitzen són substàncies tòxiques o que participen en l'efecte hivernacle en el cas que es produeixen fuites o es realitza una mala gestió dels residus. Aquesta situació ha motivat la recerca de noves tècniques o materials per tal de millorar el panorama actual. Durant les últimes dècades s'ha fet un pas important en l'estudi de materials que mantenint-se a la fase sòlida aporten efectes calòrics, tot i que els resultats encara no es poden equiparar als refrigerants actuals per compressió de gasos. En l'estat sòlid s'esperen efectes calòrics gegants, per aplicació d'un camp extern, al voltant de transicions de fase de primer ordre amb una gran calor latent associada. En aquest projecte s'han estudiat els efectes calòrics induïts per l'aplicació de pressió hidrostàtica (efectes barocalòrics o BCE). La investigació s'ha focalitzat en uns materials anomenats cristalls plàstics perquè presenten una transició molt energètica degut a una transformació d'una fase d'alta temperatura sòlida plàstica (amb desordre orientacional) a una fase de baixa temperatura completament ordenada. En concret, s'han analitzat el Tris(hydroxymethyl)aminomethane (TRIS) i el 2,2-Dimethyl-1-propanol-99% (NP A). Per a aquest estudi experimental, s'ha emprat calorimetria diferencial (DSC) a pressió atmosfèrica i anàlisi tèrmic diferencial (DTA) a alta pressió, que permeten obtenir mesures quasi-directes de l'efecte barocalòric, específicament de la variació d'entropia en un procés isoterm de canvi de pressió. Els resultats mostren unes temperatures de transició a pressió atmosfèrica de 405 K pel TRIS i 246 K per l'NPA (en l'escalfament) i uns efectes barocalòrics convencionals de $\Delta s = 673 \text{ J/(K}\cdot\text{kg)}$ a pressió 2,1 kbar pel TRIS i de $200 \text{ J/(K}\cdot\text{kg)}$ a 2,2 kbar per l'NPA que superen amb escreix (amb un factor de quasi 11 i 3, respectivament) els BCE gegants més grans analitzats fins ara en l'estat sòlid. D'altra banda els valors obtinguts de la capacitat refrigerant a les mateixes pressions són de 4420 J/kg pel TRIS i 9030 J/kg per l'NPA. No obstant, el BCE en el TRIS és irreversible en el rang de pressions estudiat degut a la presència d'una gran histèresi, del voltant de 60 graus. En el cas de l'NPA, tot i que també presenta una histèresi notable (30-35 graus), el desplaçament de la temperatura amb la pressió és prou gran ($dT/dp = 22 \text{ K/kbar}$) per començar a donar efectes barocalòrics reversibles a partir de 1,7 kbar. Amb aquests resultats es demostra que l'NPA disposa de millors propietats per el funcionament d'una màquina cíclica de refrigeració per compressió que el TRIS
- 650 4 Refrigeració, Sistemes de \$x Materials \$x TFG.
- 650 4 Cristalls plàstics \$x TFG.
- 650 4 Hidrostàtica \$x TFG.
- 650 4 Entropia \$x TFG.
- 655 4 Tesis i dissertacions electròniques.
- 700 1 Tamarit, Josep Lluís, \$e supervisor acadèmic.
- 700 1 Lloveras Muntané, Pol.
- 710 2 Escola Tècnica Superior d'Enginyeria Industrial de Barcelona.
- 710 2 Universitat Politècnica de Catalunya. \$b Departament de Física.

730 0 Treballs acadèmics UPC.

758 Efectes barocalòrics en cristalls plàstics (Text) **\$1** <https://id.oclc.org/worldcat/entity/E39PCYwJ7hdRH3KcCwqRy87HKH> **\$4** <https://id.oclc.org/worldcat/ontology/hasWork>

856 4 0 **\$z** Accés en línia **\$u** <http://hdl.handle.net/2117/99255>

ATTACHMENT 2



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ATTACHMENT 4

Cerca...



CERCA AVANÇADA

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La interfície del CCUC permet accedir a més de 12 milions de recursos de:

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- [El GEPA](#)

Inclou tot tipus de recursos (llibres, revistes, vídeos, partitures, material sonor, manuscrits...):

- Articles de 29.000 revistes electròniques
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- Contingut dels repositoris digitals

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A partir del 8 de juliol no es podran fer sol·licituds de Préstec Consorciat (PUC) pel tancament d'algunes biblioteques per vacances i perquè es fa un canvi del sistema de gestió. El servei es restablirà a partir del 16 de setembre.

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ATTACHMENT 5



71.359 UPC academic works

Efectes barocalòrics en cristalls plàstics



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Pol Català, Núria

Tutor / director: Tamarit Mur, José Luis ; Lloveras Muntané, Pol Marcel
Document type: Bachelor thesis**Date:** 2016-06-23**Rights access:** Open Access

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Abstract

En aquest moment la majoria de sistemes de refrigeració funcionen per cicles de refrigeració per compressió de gasos. Els gasos que s'utilitzen són substàncies tòxiques o que participen en l'efecte hivernacle en el cas que es produeixen fuites o es realitza una mala gestió dels residus. Aquesta situació ha motivat la recerca de noves tècniques o materials per tal de millorar el panorama actual. Durant les últimes dècades s'ha fet un pas important en l'estudi de materials que mantenint-se a la fase sòlida aporten efectes calòrics, tot i que els resultats encara no es poden equiparar als... [+]

Subjects: Cooling systems -- Materials, Plastic crystals, Hydrostatics, Entropy, Refrigeració, Sistemes de -- Materials, Cristalls plàstics, Hidrostàtica, Entropia

Degree: GRAU EN ENGINYERIA EN TECNOLOGIES INDUSTRIALS (Pla 2010)

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ATTACHMENT 6

Barcelona School of Industrial Engineering. ETSEIB



Bachelor's thesis

The curricula leading to the award of an official bachelor's degree conclude with the completion, submission and public defence of a bachelor's thesis. The thesis is compulsory and involves the completion of a comprehensive project that synthesises the knowledge acquired during bachelor's degree studies. Bachelor's theses are completed individually and defended before a university examination committee.

Types

TYPE A

Theses completed, submitted and defended at the ETSEIB under the supervision of an academic staff member assigned by the School.

TYPE B

Theses completed at a company, institution or research centre and overseen by an external supervisor who holds a university degree (Spanish or foreign). In this case, an academic staff member must be assigned at the School to act as a tutor.

TYPE C

Theses completed at another university with which the School has signed an agreement that provides for the completion of bachelor's theses within the framework of mobility programmes, under the supervision of a member of the foreign university's academic staff. Theses of this type are submitted and defended at the host university.

[Procedure for Type C](#)

TYPE D

Treball de Fi de Grau fet a l'empresa sense la supervisió d'una altra universitat. Aquest estuants hauran d'estar sota el marc dels programes de pràctiques en mobilitat. La modalitat a escollir alhora de fer el registre a l'Escola es la modalitat B.

[Procedure for Type A and Type B](#)

PROCEDURE FOR TYPE A AND TYPE B BACHELOR'S THESES

The completion of bachelor's theses is regulated by legislation in force and by the academic regulations of the UPC and the ETSEIB. Each academic year, the School publishes a bachelor's thesis calendar with the deadlines for each step in the procedure.

Theses must follow the template [\[icon\]](#) that the School makes available to students.

For further information, see the related documents [\[icon\]](#) section and the next procedure.

- [Calendars](#) [\[icon\]](#)
- [Template](#) [\[icon\]](#)
- [Related documents](#) [\[icon\]](#)

- Topic
- Registration
- Enrolment
- Partial assessment
- Deposit and approval
- Examination committees
- Defence
- Mark

Topic

Students must find a topic for their bachelor's thesis. Broadly speaking, there are two ways to do this:

- **Review the bachelor's thesis topics** proposed by the School, which can be found on the ETSEIB's bachelor's/master's thesis intranet [\[icon\]](#). Choose one and talk to a member of the ETSEIB's academic staff to agree this point before starting to work on your thesis.

- **Propose a topic** of your own and contact the ETSEIB professor who will act as your thesis supervisor. If your bachelor's thesis is to be completed at a company, you will need to agree the topic with a member of the School's academic staff who will act as a tutor.

Registration

- Once the topic has been agreed with the professor involved, students must register their thesis via the e-secretaria [\[link\]](#). Students may register their thesis when they have **90 credits** remaining to complete their degree (including credits that can be compensated and eighth semester credits). **Registration is required to enrol for the bachelor's thesis.**
- Thesis registration must be approved by the student's supervisor or the tutor via the e-secretaria [\[link\]](#). Up until the point when the thesis registration is approved by the thesis supervisor or tutor, the student may make changes via the e-Secretaria. Once the registration has been approved, the thesis supervisor or tutor must inform the Student Information and Support Service (SIAE) of any changes.

Enrolment

- Students may enrol for the bachelor's thesis when they have a **maximum of 60 ECTS credits** remaining to complete their bachelor's degree (including credits for the thesis and for subjects that can be compensated).
- **When a student's thesis has been registered and the thesis supervisor or tutor has approved the registration**, they can enrol for the thesis in a generic group. In this case, students may enrol for their thesis during the ordinary enrolment period in each semester (or, at the latest, during the period for changes indicated in the procedure calendar) by submitting an application via the e-secretaria [\[link\]](#) support service.

Extended enrolment

- Pursuant to the Academic Regulations for Bachelor's and Master's Degrees at the UPC in effect, **when a bachelor's thesis is not deposited in the semester in which the student enrolled for it, the student may choose whether to request extended enrolment for the following semester or complete the ordinary enrolment procedure in the following semester or a subsequent one.**
- Extended enrolment must be requested via the Demana [\[link\]](#) support service. For extended enrolment, students are only required to pay the fee for administrative services. Theses must be deposited by the deadline specified in the extended enrolment calendar (see calendar).

Students who intend to undertake a master's degree in the following semester are recommended to deposit and defend their bachelor's thesis in the semester in which they enrolled for it.

If the thesis topic changes, extended enrolment may not be requested

Partial assessment

- At the midpoint of the semester (if a thesis is submitted for the ordinary session), the thesis supervisor or tutor must give an assessment of the work the student has done up to that point (in relation to the objectives set) on the bachelor's/master's thesis intranet [\[link\]](#).
- Alternatively, if a thesis is submitted for the extension session, at the end of the semester, the thesis supervisor or tutor must give an assessment of the student's work on the bachelor's/master's thesis intranet [\[link\]](#).
- The period for partial assessment is indicated on the bachelor's thesis calendar.

Deposit and approval

- Students must deposit their bachelor's thesis in digital format via the bachelor's/master's thesis intranet [\[link\]](#). Digital deposit facilitates user management and the management of thesis-related documents in electronic format, ensuring their proper archiving, safekeeping and permanent conservation.
- Students must deposit their thesis in digital format via the bachelor's/master's thesis intranet [\[link\]](#) by the deadline indicated on the bachelor's thesis calendar. Theses will not be

accepted after the deadline. After a thesis has been deposited, it must be reviewed and approved by the supervisor or tutor.

- Bachelor's theses must be published in open access in the UPC Academic Works [☐](#) repository (subject to prior authorisation by the author), provided that publishing the thesis does not breach a duty of confidentiality or infringe any industrial property rights in the work.
- In the case of theses that are not published in open access in the UPC Academic Works [☐](#) repository, steps must be taken to ensure that they can be consulted for research or study purposes while respecting protected parts and confidentiality periods.
- To authorise (or not authorise) publication of their bachelor's thesis, students must complete the authorisation form available on the bachelor's/master's intranet [☐](#) before digitally depositing their thesis.
- The student's academic tutor must complete a confidentiality document for their thesis. This document can also be found on the bachelor's/master's intranet [☐](#).
- Theses that are not deposited by the deadlines indicated on the calendar may be deposited for the extension session, provided that the student applies for extended enrolment during the period indicated on the bachelor's or master's thesis calendar [☐](#). Otherwise, the student will be given a mark of Absent for their thesis.

Examination committees

- The examination committees responsible for conducting thesis defences in each session and awarding marks (and any substitutes required) will be appointed by the office of the ETSEIB assistant director responsible for bachelor's theses.
- Once a bachelor's thesis has been approved, a notice of appointment will be sent to the student and all of the examiners via the [bachelor's/master's intranet](#) [☐](#). The chair of the examination committee, who is responsible for organising the thesis defence, must notify the other members of the date, time and place proposed for the defence. If these arrangements are not acceptable to all of the members, the chair may make another proposal. Once the date, time and place for the defence have been set, the chair will communicate these details directly to the student.
- The examination committee will be composed of the thesis supervisor or tutor and two members of the School's academic staff. One of these two members will be affiliated to the thesis supervisor's (or tutor's) department. This member will act as the chair of the examination committee. The other will be an individual who is not affiliated to the department.
- In addition to the examiners, two substitutes will be appointed. One will be affiliated to the thesis supervisor's (or tutor's) department; the other will be from another department.
- Whenever possible, the examination committee will remain unchanged regardless of the session in which the thesis is defended.

Thesis defence

- Bachelor's theses are assessed in a public session in which the student gives an oral presentation and defends their thesis. Sessions are conducted by an examination committee. A thesis defence has two stages:
 - **Presentation.** The student presents a summary of their bachelor's thesis. This stage lasts around 25 minutes (the time is determined by the chair and communicated in advance).
 - **Defense.** The student defends their thesis by responding to questions from the examiners.
- If a bachelor's thesis makes reference to matters that are subject to confidentiality restrictions and/or affect intellectual or industrial property, the examination committee may establish mechanisms to maintain confidentiality and protect the IP. Such mechanisms may affect the public defence of a thesis and will include the signing of a confidentiality agreement by the examiners. The confidentiality agreement is available to examiners via the final thesis intranet. The document must be completed, signed and submitted to the SIAE together with the official bachelor's thesis assessment results.
- If a bachelor's thesis is intended to demonstrate the generic foreign language competency, the thesis and defence must be in that language. (This point only applies to students admitted to their bachelor's degree before the 2014/15 academic year).

- Bachelor's theses completed during a period of mobility  will be defended at the host university in accordance with the rules that apply to thesis supervision and presentation at the host institution (see the section on type C bachelor's theses).
- The School will provide students with any **audiovisual equipment** it has available. **Students are responsible** for requesting equipment, checking that it is in good working order, and ensuring its proper use. Requests to use audiovisual equipment are handled by the reception service
- Under no circumstances may a student present and orally defend their bachelor's thesis by remote means (videoconference, Skype, etc.).

Mark

- Once the presentation and defence of the thesis has been completed, the examination committee will deliberate in **closed session** and then **publicly** announce the mark awarded.
- Each member of the examination committee will assess the thesis and the presentation and defence, based on the criteria specified in the Bachelor's Thesis Assessment Guidelines.
- The decision on the mark to be awarded may be taken unanimously or by a simple majority vote.
- Bachelor's thesis marks:
 - If the mark is **Pass**, it will be included in the official examination results that the chair sends to the SIAE.
 - If the mark is **Fail**, the chair will indicate this on the official examination results, which will be sent to the SIAE together with any written comments that the chair deems appropriate.
In this case, the student will have to complete the ordinary enrolment process in the next semester or a subsequent one. For ordinary enrolment, students must pay all fees, including the surcharge for retaking the thesis, as stipulated in the decree on fees.
 - Students who do not attend their bachelor's thesis defence will be given a mark of **Absent** (Catalan acronym: **NP**). In this case, pursuant to the Academic Regulations for Bachelor's and Master's Degrees at the UPC in effect, **the student may choose whether to request extended enrolment for the following semester or complete the ordinary enrolment procedure in the following semester or a subsequent one.**

Thesis submission and defence deadlines for each thesis type are indicated in the bachelor's thesis calendar.

If the topic of a bachelor's thesis changes, extended enrolment may not be requested.

- It is important to bear in mind the provisions of the Academic Regulations for Bachelor's and Master's Degrees at the UPC with respect to distinctions:
 - In the case of bachelor's theses, **the examiners may propose that a distinction be awarded**. In the case of an external placement, the tutor will make the proposal. Based on these proposals, the School will make the final decision on how distinctions are awarded, without exceeding 5% of the number of enrolled students, and based on objective criteria in all cases.
 - **If the number of distinctions awarded to students with ordinary enrolment reaches the 5% limit, no distinctions may be awarded to students who opted for extended enrolment** for their bachelor's thesis or completed their thesis on an external placement.
- The academic records of students are closed approximately **one week** after the date on which they present and defend their bachelor's thesis. If the bachelor's thesis credits were the last ones a student needed to pass, at that point they may request a degree certificate and other documents certifying that they have successfully completed their degree.

PROCEDURE FOR TYPE C BACHELOR'S THESES

- Topic
- Enrolment
- Registration

Defence and assessment

- Deposit
- Mark

Topic

- Students who have been granted SICUE mobility places that envisage the completion of a bachelor's thesis must find a tutor at the host university before undertaking their period of mobility and agree the topic of their bachelor's thesis with that professor in accordance with the procedure and requirements that apply at the host institution.

Enrolment

- Given the characteristics and the calendar for periods of mobility, and the requirement that students register their bachelor's thesis before completing the ordinary enrolment process, the ETSEIB International Relations Office will register bachelor's theses provisionally as "pending".
- Once their thesis is registered, students must complete the ordinary enrolment process via the e-secretaria [\[a\]](#) on the date and at the time scheduled. Where applicable, they must also enrol for the block of credits that will be recognised for their period of mobility.

Registration

- Once the title of the bachelor's thesis is final (two months after the start of the period of mobility at the latest), the student may add it to their thesis registration in the e-secretaria [\[a\]](#) by completing the "Thesis title" and "Description" sections. Students must also provide the full name of their tutor or thesis supervisor at the host university in the "Comments" section. In the "Examiners" section, students should select the Department of Management and add Professor Lucas van Wunnik, the assistant director of Internationalisation, as the thesis supervisor. (Prof Van Wunnik acts as the supervisor for theses of this type.)

Defence and assessment

- Bachelor's theses completed during a period of mobility are defended at the host university in accordance with its requirements and regulations on thesis defence and assessment.
- Students who do not defend their bachelor's thesis at the host university at the end of the semester in which they enrolled for it at the School will be deemed to have opted for extended enrolment. In this case, the International Relations and Admissions Office will complete the extended enrolment.

Deposit

- Once a bachelor's thesis has been defended and assessed at the host university, the student must deposit a copy via the School's bachelor's/master's intranet [\[a\]](#) application. Bachelor's theses must be published in open access in the UPC Academic Works [\[a\]](#) repository, subject to prior authorisation by the author, provided that publishing the thesis does not breach a duty of confidentiality or infringe any industrial property rights arising from the research.
- In the case of theses that are not published in open access in the UPC Academic Works [\[a\]](#) repository, steps must be taken to ensure that they can be consulted for research or study purposes while respecting protected parts and confidentiality periods.
- To authorise publication of their thesis and/or specify any confidentiality requirements that apply, students must complete the authorisation form available on the School's bachelor's/master's intranet [\[a\]](#) before digitally depositing their thesis.

Mark

- Once a student has deposited their bachelor's thesis via the bachelor's/master's thesis intranet [\[i\]](#), the host university has sent the International Relations and Admissions Office their official academic transcript with the mark for the thesis, and the student has submitted all documentation related to the period of mobility, the student's thesis supervisor at the ETSEIB will initiate the bachelor's thesis review, approval and assessment procedure. The resulting mark will be indicated on the student's official examination results for the bachelor's thesis.
- Students may view the status of documentation for their period of mobility at the e-secretaria [\[i\]](#) "Mobility"-"Period of mobility"-"Documentation".
- Students who receive a mark of **Fail** on their bachelor's thesis must complete the ordinary enrolment process in the following semester or a subsequent one. In this case, they must enrol for both the bachelor's thesis credits and credits for the extension, taking into account the study load for their bachelor's thesis at the foreign university. For ordinary enrolment, students must pay all fees, including the surcharge for retaking the thesis, as stipulated in the decree on fees.

UPC [\[i\]](#). Barcelona School of Industrial Engineering
Av. Diagonal, 647. 08028 Barcelona - [\[i\]](#) Tel.: 93 401 66 15

ATTACHMENT 7



DCMI Schemas

The Dublin Core™ Metadata Initiative provides access to schemas defining DCMI term declarations represented in various schema languages. Schemas are machine-processable specifications which define the structure and syntax of metadata specifications in a formal schema language.

The links below identify the schema languages currently supported within the DCMI Community. If you have schemas for DCMI metadata that you believe should be linked here, please contact DCMI via the feedback button at the top of the page.

Brief descriptive data about the schemas currently supported will be found on these linked pages, as well as links to the schemas themselves.

- [XMLS Schemas](#)
- [RDFS Schemas](#)



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ATTACHMENT 8

Date Issued

Vocabulary:	DCMI Metadata Terms
URI	http://purl.org/dc/terms/issued
Label	Date Issued
Definition	Date of formal issuance of the resource.
Comment	Recommended practice is to describe the date, date/time, or period of time as recommended for the property Date, of which this is a subproperty.
Type of Term	Property
Has Range	http://www.w3.org/2000/01/rdf-schema#Literal
Subproperty of	Date (http://purl.org/dc/elements/1.1/date) Date (http://purl.org/dc/terms/date)

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Authors Name
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Efectes barocalòrics en cristalls plàstics 

Pol Català, Núria (Universitat Politècnica de Catalunya, 2016-06-23)

Bachelor thesis

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En aquest moment la majoria de sistemes de refrigeració funcionen per cicles de refrigeració per compressió de gasos. Els gasos que s'utilitzen són substàncies tòxiques o que participen en l'efecte hivernacle en el cas ...



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