



APDIC report 2023

French contribution

Jean-Marc Joubert

21st June 2024

1. Group activities in 2023

The recently created Association Française de Thermodynamique des Matériaux (AFTherMat, French Association for Thermodynamic of Materials) entered in its third year of existence and now has ~110 formal members. The Board of Directors is composed by Olivier Dezellus (President), Jean-Marc Joubert then Pierre Benigni (from 1st January 2024) (Treasurer) and Sophie Schuller (Secretary).

We gather all the French activities on the thermodynamics of the materials at high temperature, including a significant contribution to the phase diagrams of alloys and ceramics and a lot of activities on glasses.

A poster representing the activities of our group was created and is reproduced at the end of this document.

The annual meeting took place 9th-10th November 2023 in Orléans organized by Emmanuel De Bilbao. It gathered ~45 people including 15 PhD students with poster and oral presentations and the General Assembly.

AFTherMat is still following the activities, as a foreign participant, of the Thermodynamic Consortium (ThermoCon) of Alexandra Navrotsky. Christophe Drouet (Cirimat, Toulouse) represents the association to the ThermoCon meetings. <https://www.thermocon.org/>

We are members of two important societies: the French Materials Federation (FFM, <https://www.ffmateriaux.org/>) and National Network of Metallurgy (RNM, <https://www.rnm-metallurgie.fr/>).

We have launched, a series of online seminars. These are recorded and available on our Youtube channel (@afthermat3308).

List of seminars held since the last APDIC report:

- July 06 2023 - Webinar AFTherMat #10 - Thermal Analysis Basics #2 - Advanced concepts and application to phase diagram determination - Pierre Benigni
<https://www.youtube.com/watch?v=eu3VhILQh8Q&t=999s>
 - September 27 2023 - Webinar AFTherMat #11 - Machine Learning in materials science - Jean-Claude Crivello
<https://www.youtube.com/watch?v=WpKDg4qv9Zw>
 - October 10 2023 - Webinar AFTherMat #12 - Reactive diffusion in microelectronics Dominique Mangelinck
https://www.youtube.com/watch?v=PKJf_NQ3zqY
 - November 30 2023 - Webinar AFTherMat #13 - Rodica Chiriac - Simultaneous Thermal Analysis and Emitted Gas Analysis
https://www.youtube.com/watch?v=QpnXJ_c7MAU&t=620s
 - December 14 2023 - Webinar AFTherMat #14 - Marc Barrachin - Thermodynamics applied to severe accidents
https://www.youtube.com/watch?v=2m_YS5QaxLM
 - January 24 2024 - Webinar #15 - Determination and modeling of thermophysical properties of corium for severe accident applications - Caroline Denier
<https://www.youtube.com/watch?v=vaSEpzBoPQE>
 - February 21 2024 – Webinar #16 - Alloy thermodynamics of the Fe-C system: are ferrite, martensite and bainite? - Philippe Maugis
<https://www.youtube.com/watch?v=Oj295vFud5k>
 - March 14 2024 - Webinar #17 - A new thermodynamic model of interactions between platinum fission products (Pd, Rh, Ru) and molybdenum - Stéphane Gossé
<https://www.youtube.com/watch?v=GNTEkZcWA-4&t=5s>
 - April 03 2024 - Webinar #18 - Fuel thermodynamics for nuclear reactors - Christine Guéneau
<https://www.youtube.com/watch?v=zunuwM4wEp4&t=3551s>
 - May 15 2024 - Webinar #19 - Analysis of solidification microstructures to reconstruct crystallization paths – Annie Antoni – Zdziobek
<https://www.youtube.com/watch?v=3gRGXX5GKoI&t=260s>
 - June 12 2024 - Webinar #20 - The use of a thermodynamic basis in a phase field model through nuclear applications – Romain Le Tellier
<https://www.youtube.com/watch?v=n7vmWJXA7xA&t=29s>
- Coming soon :
- July 10 2024 – Webinar #21 - Development of a thermodynamic model applied to lithium-ion batteries – Lucas Tosin Paese

- September 18 2024 – Webinar #22 - Modeling non-equilibrium solidification - Thermodynamic approach to interfacial growth – Gildas Guillemot
- Octobre 23 2024 - Webinar #23 - Machine learning of thermodynamic data: from phase diagram determination to alloy design – Guillaume Deffrennes

We have also reinforced our teaching activities. We organized two in person formations on:

- Analysis of X-ray diffraction data and Rietveld analysis (3 days, January 2023, 20 persons). This formation was not held again this year but is planned for 2025.
- Thermo-Calc for beginners (2 days, January 2024, 20 persons)

2. Website development

Our new website <https://www.afthermat.fr/> is not yet fully operational. In the meantime, the old website is still available: <https://www.thermatht.fr/>

It contains:

- job offers: <https://www.thermatht.fr/offres-demploi/>
- useful pages containing tutorials or description of instrumental methods. We can highlight new pages on:
 - experimental measurement of thermodynamic properties at high temperature: <https://www.thermatht.fr/methodes-experimentales-de-la-thermodynamique-des-materiaux-a-hautes-temperatures/>
 - mass spectroscopy: <https://www.thermatht.fr/spectrometrie-de-masse-a-haute-temperature/>
 - tutorial on the Rietveld method: <https://www.thermatht.fr/conduite-dun-affinement-par-la-methode-de-rietveld/>
 - the Calphad method: <https://www.thermatht.fr/modelisation-thermodynamique-par-la-methode-calphad/>
 - list of sources for thermodynamic data: <https://www.thermatht.fr/sources-de-donnees-thermodynamiques/>
 - reference books: <https://www.thermatht.fr/ouvrages-de-reference/>
 - useful links: <https://www.thermatht.fr/liens-incontournables/>
- a facility is available representing a skill inventory of the different members of the GdR/association. It can be found at <https://www.thermatht.fr/bdd-liste-enregistrements/>. A search can be made according to different criteria like skills, or systems of interest.

The website is in French, but many pages are easily understandable.

3. Main events related to Phase Diagrams in France in 2023

3.1. French-German speaking workshop

The second French-German-Austrian meeting on thermodynamics and kinetics of materials was held in Karlsruhe, February 2-3, 2023, organized by Hans Seifert and Stephanie Lippmann. It gathered almost 50 persons.

3.2. Summer school on High Entropy Alloys

A summer school on high entropy alloys was organized in Cargese (Corsica), 10th-16th September. A special session was dedicated to thermodynamic calculations including training.

3.3. Thermo-Calc user meeting

The French Thermo-Calc user meeting was organized in Lyon 23rd-24th October thanks to Olivier Dezellus.

3.4. Annual meeting

Our annual meeting took place in Orléans, 9th-10th November, organized by E. De Bilbao.

4. Upcoming events in 2023

4.1. Book: Thermodynamic data: from acquisition to application (in French)

In line with our thermodynamic school, a book will be published containing lectures and exercises on different subjects like calorimetry, thermal analysis, ab initio calculations, phase diagram determination, Calphad modeling...

4.2. TOFA

The Thermodynamic OF Alloys conference will be held in Lyon, 23rd-27th September 2024, organized by O. Dezellus. <https://tofa2024.univ-lyon1.fr>

4.3. Annual meeting

Our annual meeting will take place in Paris, Université Pierre et Marie Curie, 28th November.

4.4. Theme day on the thermodynamics of liquids

A theme day on liquid thermodynamics is currently being organized. It will be held on November 29, 2024 at the IPGP in Paris. This event is co-organized by the AFTherMat association, USTV and SFMC (Société Française de Minéralogie et de Cristallographie), with the support of FFM and MITI of CNRS.

The aim is to bring together the academic and industrial communities in the metallurgy, ceramics, nuclear and geology sectors to discuss the issues and data needs in liquid thermodynamics.

Presentations will be given on the current state of the art and on existing liquid thermodynamics tools, methods and models. This will be followed by a round-table discussion of possible courses of action and priority areas for development. One of the underlying objectives is to create consortia and support teams for national and international calls.

4.5. Summer school on the thermodynamic of materials

A new edition of our summer school on the thermodynamics of materials will be held in Fréjus, 13th-17th October 2025.

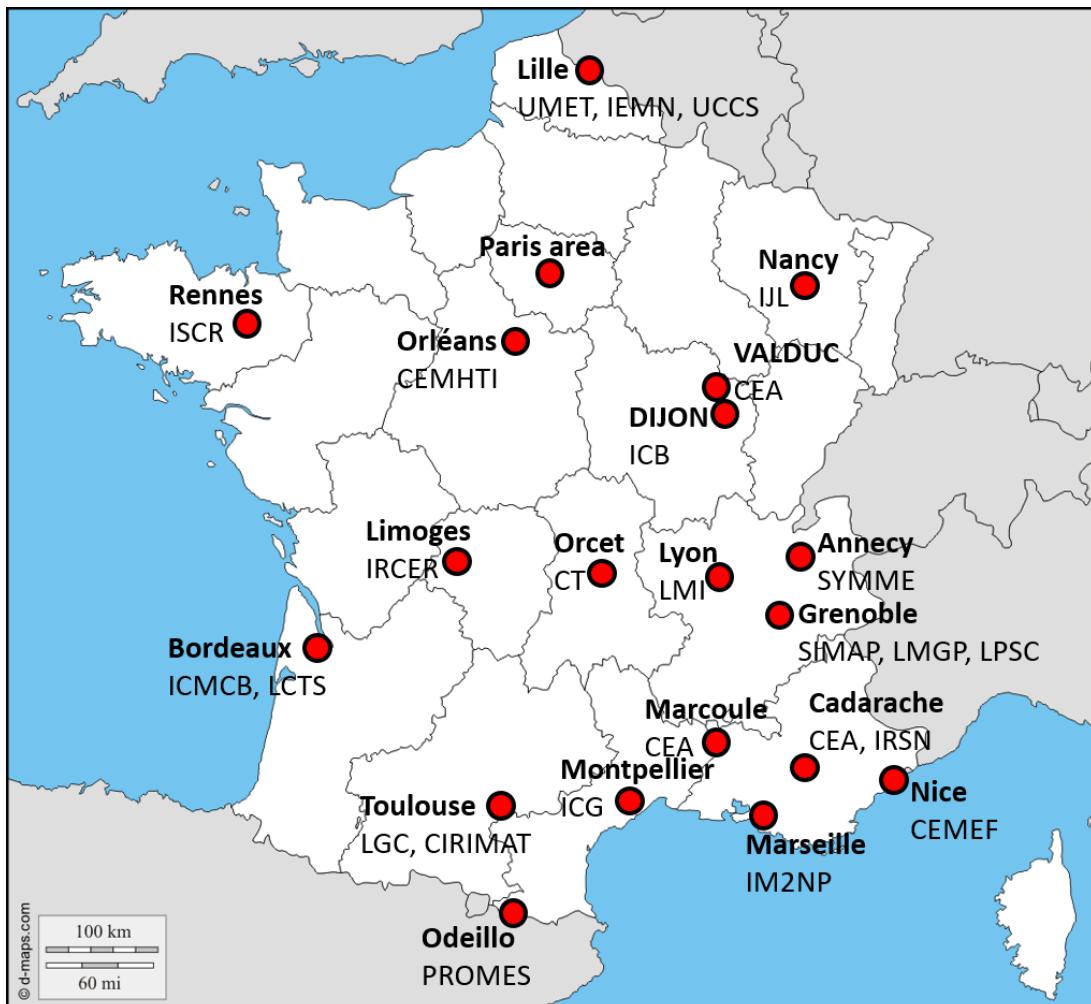
5. List of members of the AFTherMat association with affiliation and contact

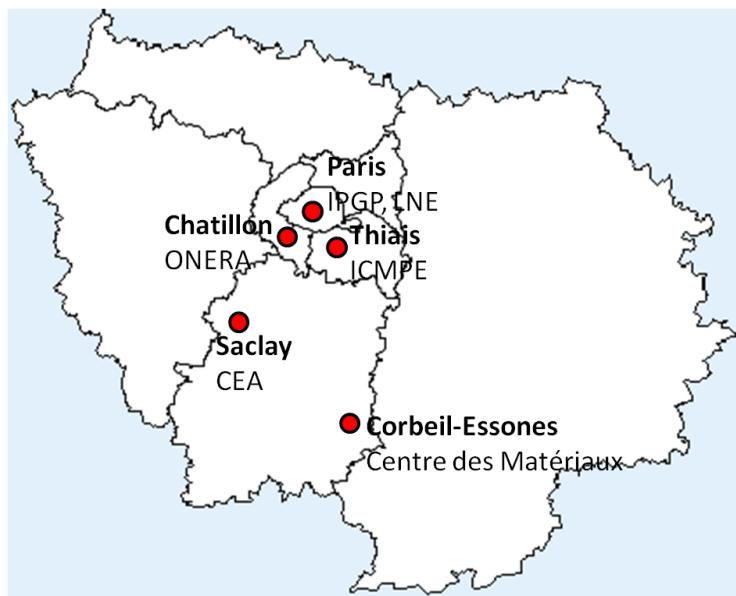
Name	First Name	E-mail	Institution
Andrieux	Jérôme	jerome.andrieux@univ-lyon1.fr	LMI UMR CNRS 5615
Antoni-Zdziobek	Annie	annie.antoni@grenoble-inp.fr	Grenoble INP / SIMAP
Ardigo-Besnard	Maria-Rosa	maria-rosa.ardigo-besnard@u-bourgogne.fr	Université de Bourgogne / ICB
Ariane	Mostapha	mostapha.ariane@u-bourgogne.fr	Université de Bourgogne / ICB
Baras	Florence	florence.baras@u-bourgogne.fr	Université de Bourgogne / ICB
Barberis	Pierre	pierre.barberis@areva.com	Framatome
Barrachin	Marc	marc.barrachin@irsn.fr	IRSN Cadarache
Barrat	Silvère	silvere.barrat@univ-lorraine.fr	CNRS Orléans
Benigni	Pierre	p.benigni@univ-amu.fr	IM2NP - Aix-Marseille University, CNRS
Bornand	Manon	manon.bornand@grenoble-inp.fr	SIMAP
Bossy	Matthieu	matthieu.bossy@insa-lyon.fr	MATEIS LaMCoS
Brassamin	Séverine	severine.brassamin@cnrs-orleans.fr	CNRS Orléans
Burov	Ekaterina	ekaterina.burov@saint-gobain.com	Saint Gobain
Camara	Nimbo	nimbo.camara@cea.fr	CEA Grenoble
Cénac Lahon	Anne-Laure	anne-laure.cenac-lahon-debat@insa-lyon.fr	INSA Lyon
Débat			
Charvet	Romain	romain_charvet@etu.u-bourgogne.fr	Université de Bourgogne / Laboratoire
Chatain	Sylvie	sylvie.chatain@cea.fr	CEA Saclay
Chatillon	Christian	christian.chatillon0979@orange.fr	SIMAP
Chatron-Michaud	Paul	paul.chatron-michaud@insa-lyon.fr	INSA Lyon
Chaumat	Valerie	valerie.chaumat@cea.fr	CEA Grenoble
Ciszak	Clément	clement.ciszak@cea.fr	CEA
Crochetet	Adrien	adrien.crochetet@cnrs-orleans.fr	CNRS Orléans
David	Nicolas	nicolas.david@univ-lorraine.fr	IJL Nancy
De Azevedo	Antonin	antonin.deazevedo@cea.fr	CEA Cadarache
de Bilbao	Emmanuel	emmanuel.debilbao@cnrs-orleans.fr	CNRS Orléans
De Ligny	Dominique	dominique.de.ligny@fau.de	FAU Lehrstuhl für Glas und Keramik
de Villoutreys	Eloi	eloi.devilloutreysdebrignac@cea.fr	CEA
Deffrennes	Guillaume	guillaume.deffrennes@cnrs.fr	SIMAP
Denier	Caroline	carodenier@gmail.com	CEA Cadarache
Desseaux	Mathias	mathias.desseaux@gmail.com	LMI
Dezellus	Olivier	olivier.dezellus@univ-lyon1.fr	LMI
Dugénie	Kévin	kevin.dugenie@cea.fr	CEA Grenoble
Duncan	Euan	euan.duncan@cnrs-orleans.fr	CNRS Orléans
Dupin	Nathalie	nathdupin@cthermo.fr	Calcul Thermodynamique Orcet
Epifano	Enrica	enrica.epifano@toulouse-inp.fr	CIRIMAT
Ermini	Ilse	ilse.ermini@cnrs-orleans.fr	CNRS Orléans
Fer	Benoit	benoit.fer@onera.fr	ONERA
Fiorani	Jean Marc	jean-marc.fiorani@univ-lorraine.fr	IJL Nancy
Fischer	Evelyne	evelyne.fischer@grenoble-inp.fr	SIMAP
Flores	Agustin	agustin.flores@cea.fr	CEA
Fourmont	Adrien	adrien.fourmont@cea.fr	CEA
Fraczkiewicz	Anna	fraczkie@emse.fr	Ecole des Mines Saint-Etienne

Gaboriaux	Manon	marion.gaborieau@rockwool.com	ROCKWOOL
Gandin	Charles-André	charles-andre.gandin@minesparis.psl.eu	MINES ParisTech CEMEF
Garcia	Julien	julien.garcia.2@cnrs.fr	CNRS
Gheno	Thomas	thomas.gheno@onera.fr	ONERA
Gossé	Stéphane	stephane.gosse@cea.fr	CEA-Saclay
Guénéau	Christine	christine.gueneau@cea.fr	CEA Saclay LM2T
Guillemot	Gildas	gildas.guillemot@mines-paristech.fr	MINES ParisTech CEMEF
Hureaux	Thibaud	thibaud.hureaux@etu.univ-lyon1.fr	LMI
Joubert	Jean-Marc	jean-marc.joubert@cnrs.fr	ICMPE CNRS
Journeau	Christophe	christophe.journeau@cea.fr	CEA
Kepa	Thomas	thomas.kepa1@univ-lr.fr	LaSIE
Le Gallet	Sophie	sophie.le-gallet@u-bourgogne.fr	9 av. Alain Savary, BP 47870, 21078 Dijon
Le Ny	Yann	yann.leny@kep-technologies.com	KEP Technologies
Maillard	Serge	serge.maillard@cea.fr	CEA
Marciano	Erwan	erwan.marciano@insa-lyon.fr	INSA Lyon
Masteri Farahani	Sohrab	sohrab.masteri.farahani@thyssenkrupp.com	R&D Thyssenkrupp electrical steel UGO
Mathieu	Romain	romain.mathieu@rockwool.com	ROCKWOOL International Group Research and Development
Mathieu	Stéphane	stephane.mathieu@univ-lorraine.fr	IJL Nancy
Mawalala	Chancel	c.mawalalamoundounga@sheffield.ac.uk	Sheffield University
Moundounga			
Méreaux	Ludovic	ludovic.mereaux@etu.unilim.fr	IRCER
Michel	Bénédicte	benedicte.michel@irsn.fr	IRSN Cadarache
Mikaelian	Georges	georges.mikaelian@univ-amu.fr	IM2NP - Aix-Marseille University
Moser	Mathias	mathias.moser@u-bourgogne.fr	Laboratoire Interdisciplinaire Carnot de Bourgogne
Mvodo Eba	Reine	reine.mvodo-eba@u-bourgogne.fr	Université de Bourgogne / ICB
naciri	kaoutar	kaoutar.naciri@simap.grenoble-inp.fr	SIMAP
Neuville	Daniel	neuville@ipgp.fr	IPGP - Université de Paris Cité
Nuta	Ioana	ioana.nuta@grenoble-inp.fr	SIMAP
Oudot	Benoit	benoit.oudot@cea.fr	CEA
Palluel	Marlène	mpalluel@favi.com	FAVI
Panteix	Pierre-Jean	pierre-jean.panteix@univ-lorraine.fr	IJL Nancy
Pascal	Céline	celine.pascal@simap.grenoble-inp.fr	SIMAP
Petitjean	Carine	carine.petitjean@univ-lorraine.fr	IJL Nancy
Piel	Damien	damien.piel@etudiant.univ-lr.fr	LASIE
Piette	Michel	michel.piette@vallourec.com	Vallourec
Politano	Olivier	olivier.politano@u-bourgogne.fr	Université de Bourgogne / ICB
Puydoyeux	Nina	nina.puydoyeux@toulouse-inp.fr	CIRIMAT
Razouk	Refat	refat.razouk@lne.fr	LNE
Reynaud	Vinciane	vinciane.reynaud@cnrs-orleans.fr	CNRS Orléans
Ricard	Matthieu	matthieu.ricard@simap.grenoble-inp.fr	SIMAP GPM2 Constellium C-TEC
Rogez	Jacques	j.rogez@univ-amu.fr	IM2NP - Aix-Marseille University, CNRS
Saint-Jean	Louis	louis.saint-jean@univ-lorraine.fr	IJL Nancy
Seve	Gabrielle	seve@lcts.u-bordeaux.fr	LCTS, UMR 5801
Tamim	Rkia	rkia.tamim@cea.fr	CEA
Tixier	Audrey	audrey.tixier@cnrs-orleans.fr	CNRS Orléans

Tourneix	Arthur	arthurtx88@gmail.com	CEA
Valois	Renaud	renaud.valois@cnrs-orleans.fr	CNRS Orléans
Vaubois	Thomas	thomas.vaubois@safrangroup.com	SAFRAN
Vilasi	Michel	michel.vilasi@univ-lorraine.fr	IJL Nancy
Youssef	Sawsen	sawsen.youssef@univ-orleans.fr	Université Orléans

Maps indicating the localization of the different research centers in France and in Paris area:





AFTherMat

Association Française de Thermodynamique des Matériaux

Association loi 1901, created in 2021, whose purpose is to contribute to the development and dissemination of knowledge in the field of thermodynamics of materials. Its aim is to contribute to the advancement of research and technology in thermodynamics for the benefit of the French-speaking community..

WHO ARE WE ?

More than 100 members:

- academics, students,
- industrials (nuclear, metallurgy, ceramics, materials for energetic transition...)

JOIN US !

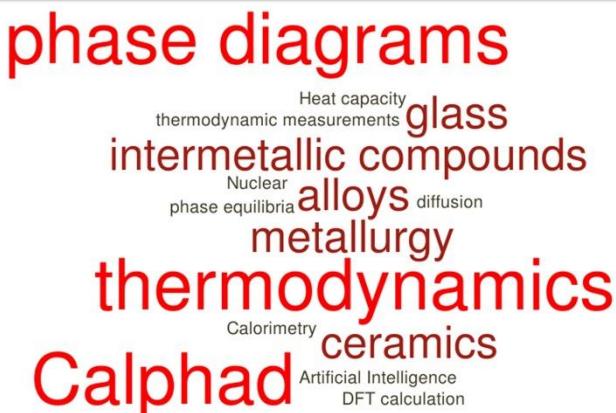
<https://www.afthermat.fr/>

BOARD & COUNCIL

Administration council of 12 people

Board:

- President : Olivier Dezellus
- Treasurer : Jean-Marc Joubert
- Secretary : Sophie Schuller



ACTIONS

Courses

- Crystallography, Rietveld method (yearly)
- ThermoCalc for beginners (yearly)
- ThermoCalc: applications (La Métallurgie quel Avenir 2023)
- Thermodynamic for specific summer schools (HEA 2023)

Dissemination

- Webinars (experimental methods, thermodynamic models, calculations, applications...): Youtube channel



AFTherMat
@afthermat3308 34 abonnés 9 vidéos

Chaine de l'Association Française de Thermodynamique des Matériaux >

- Yearly seminar of AFTherMat

NETWORK

AFTherMat is proudly member of

