

Florian Le Goupil, PhD

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DOB : 28/01/85 (34)

WORK EXPERIENCE

- Université de Bordeaux, Bordeaux, France** Jan. 2020–Now
Post-Doctoral Research Associate
PI: Prof. Georges Hadziioannou
Design and structural engineering of fluorinated polymers for efficient refrigeration and energy storage.
- ELORPrinTec (Adéra), Bordeaux, France** July 2019–Aug 2019 / Oct. 2019 – Dec. 2019
Project Manager
Design and fabrication of a fully printed portable and flexible organic solid-state cooling device.
- Université de Bordeaux, Bordeaux, France** July 2017–June 2019
Marie Curie/PRESTIGE Post-Doctoral Research Fellow
PI: Prof. Georges Hadziioannou
Synthesis and characterisation of flexible composites based on fluorinated polymers for energy applications.
- Université de Bordeaux, Bordeaux, France** Nov 2016–June 2017
Post-Doctoral Research Associate
PI: Prof. Georges Hadziioannou
Study of the influence of surface modification of inorganic nanoparticles on the properties of composite films.
- Imperial College London, London, UK** Dec 2015–May 2016
Post-Doctoral Research Associate
PI: Prof. Natalie Stingelin
Synthesis and characterisation of solution-processable composites and hybrid materials.
- Penn State University, State College PA, USA** Nov 2014–Nov 2015
Royal Society Visiting Scholar
PI: Prof. Clive Randall
Fabrication and characterisation of lead-free multilayer ceramic capacitors for electrocaloric applications.
- Imperial College London, London, UK** Mar 2013–Nov 2015
Post-Doctoral Research Associate
PI: Prof. Neil McN. Alford
First direct Electrocaloric Effect (ECE) study of numerous lead-free relaxor ferroelectric materials.
First Experimental proof of high ECE anisotropy.
Tuning of morphotropic phase boundary and accompanied ECE enhancement in NBT-based ceramics.
Development of theoretical models based on statistical mechanics describing the ECE in relaxor ferroelectrics.
EPSRC Pathway to Impact development of a DSC-fixture for ECE and pyroelectric measurements.
Established collaborations with research groups in Slovenia, Finland, Poland, USA as well as several within the UK.
- National University of Singapore (NUS), Singapore** July 2010
Visiting Student
PI: Prof. Ramanathan Mahendiran
Dielectric and Ferroelectric characterisation of epitaxial tungsten bronze thin films.
- Massachusetts Institute of Technology (MIT), Cambridge MA, USA** May–Aug 2009
Visiting Student
PI: Prof. Gareth McKinley
In association with Harvard University and TA Instruments, development and testing of a new opposed-nozzle fixture, which can be mounted onto controlled strain rheometers, for the measurement of the extensional properties of low

viscosity liquids. This research led to a poster which won the Award for Best Post-doctoral Poster at the Society of Rheology Annual Meeting held in 2009 in Madison (USA).

Robert Bosch GmbH, Stuttgart, Germany

Apr–Oct 2008

Intern

Synthesis and characterisation of nanocrystalline oxide ceramics doped with aliovalent-metal-ions.

NXP Semiconductors (former Philips), Nijmegen, The Netherlands

Sept 07–Feb 08

Intern

Study and optimisation of the removal mechanism of particles on Silicon “wafers”.

Chemistry, Physics and Materials Science Institute (IPCMS), Strasbourg, France

Oct–Nov 2006

Intern

Synthesis of hybrid lamellar organometallic compounds.

EDUCATION

Imperial College London, London, UK

Sept 2009- Feb 2013

PhD in Materials Science

Supervisors: Prof. Neil McN. Alford and Dr. Anna-Karin Axelsson

Successful development and benchmarking of a direct electrocaloric effect measurement set-up based on a modified-differential scanning calorimeter, allowing the acquisition of both thermal and electrical information simultaneously. Direct ECE measurements on normal ferroelectrics, such as barium titanate, but also well-known relaxor ferroelectrics, such as the PMN-PT system, for fundamental understanding of the electrocaloric effect.

Solid state synthesis and characterisation of highly anisotropic relaxor ferroelectrics, including Aurivillius Phase and Tungsten Bronze Materials. Synthesis of grain-oriented ceramics by hot-pressing and templated grain-growth.

Supervision of several undergraduates and Master Students.

Université de Strasbourg, Strasbourg, France

2009

Master's Degree in Materials Science

School of Chemistry, Polymers and Materials Science (ECPM), Strasbourg, France

2005-2009

Diplôme d'ingénieur, ranked second

Specialization in Materials Science. Engineering school where courses are taught in three languages.

RESEARCH EXPERIENCE AND TECHNICAL SKILLS

Expert user

Direct electrocaloric measurements, high and low field dielectric spectroscopy, differential scanning calorimetry (DSC), X-Ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), energy dispersive X-Rays (EDX), solid state synthesis, hot-pressing, solution-processed polymer film fabrication including spin- and blade-coating and screen-printing, tape-casting for MLC fabrication, thermal evaporation.

Experienced user

Neutrons diffraction, pulsed laser deposition (PLD) and ultra high vacuum (UHV) systems.

ADDITIONAL SKILLS

French: native language, English: fluent, German: competent, Spanish: competent

Active reviewer for 13 high-impact journals.

AWARDS AND FUNDING

Royal Academy of Engineering travel grant (£500) and Royal Society of Chemistry travel grant (£800)

Royal Society International Exchange Scheme (£6000)

Marie Curie/PRESTIGE Post-Doctoral Research Fellowship (30000€)

LIST of PUBLICATIONS

Peer Reviewed Articles (13 articles, 479 citations)

- 1) **F. Le Goupil**, A. Baker, F. Tonus, *et al.*, "Direct measurement of electrocaloric effect in lead-free (Na_{0.5}Bi_{0.5})TiO₃-based multilayer ceramic capacitors", *Journal of the European Ceramic Society* 39, 11, 3315-3319 (2019).
- 2) A-K. Axelsson, **F. Le Goupil**, M. Valant, N. M. Alford, "Optimisation of SrBi₂(Nb,Ta)₂O₉ Aurivillius phase for lead-free electrocaloric cooling", *Journal of the European Ceramic Society* 38, 16, 5354-5358 (2018).
- 3) C. Molin, J. Peräntie, **F. Le Goupil**, *et al.*, "Comparison of Direct Electrocaloric Characterization Methods Exemplified by 0.92 Pb(Mg_{1/3}Nb_{2/3})O₃ - 0.08 PbTiO₃ Multilayer Ceramics", *J. American Ceramic Society* 100, 7, 2885-2892 (2017).
- 4) A-K. Axelsson, **F. Le Goupil**, M. Valant, *et al.*, "Electrocaloric effect in lead-free Aurivillius relaxor ferroelectric ceramics", *Acta Materialia* 124, 120-126 (2017).
- 5) **F. Le Goupil**, R. McKinnon, V. Koval, G. Viola, S. Dunn, *et al.*, "Tuning the electrocaloric enhancement near the morphotropic phase boundary in lead-free ceramics", *Scientific Reports* 6, 28251 (2016).
- 6) A. Berenov, **F. Le Goupil**, and N. McN. Alford, "Effect of ionic radii on the Curie temperature in Ba_{1-x}-ySr_xCayTiO₃ compounds", *Scientific Reports* 6, 28055 (2016).
- 7) **F. Le Goupil** and N. M. Alford, "Upper limit of the electrocaloric peak in lead-free ferroelectric relaxor ceramics", *APL Materials* 4, 064104 (2016).
- 8) **F. Le Goupil**, J. Bennett, A-K. Axelsson, *et al.*, "Electrocaloric enhancement near the morphotropic phase boundary in lead-free NBT-KBT ceramics", *Applied Physics Letters* 107, 172903 (2015).
- 9) **F. Le Goupil**, A-K. Axelsson, M. Valant, *et al.*, "Effect of Ce doping on the electrocaloric effect of Sr_xBa_{1-x}Nb₂O₆ single crystals", *Applied Physics Letters* 104, 222911 (2014).
- 10) **F. Le Goupil**, A-K. Axelsson, L. J. Dunne, *et al.*, "Anisotropy of the Electrocaloric Effect in Lead-Free Relaxor Ferroelectrics", *Advanced Energy Materials* 4, 1301688 (2014).
- 11) A-K. Axelsson, **F. Le Goupil**, *et al.*, "Microscopic interpretation of sign reversal in the electrocaloric effect in a ferroelectric PbMg_{1/3}Nb_{2/3}O₃-30PbTiO₃ single crystal", *Applied Physics Letters* 102, 102902 (2013).
- 12) M. Valant, A-K. Axelsson, **F. Le Goupil**, N. M. Alford, "Electrocaloric temperature change constrained by the dielectric strength", *Materials Chemistry and Physics* 136, 277-280 (2012).
- 13) **F. Le Goupil**, A. Berenov, A-K. Axelsson, *et al.*, "Direct and Indirect Electrocaloric Measurements on <001>-PbMg_{1/3}Nb_{2/3}O₃-30PbTiO₃ Single Crystals", *Journal of Applied Physics* 111 (2012) 124109.

Book

Anna-Karin Axelsson, Matjaz Valant, **Florian Le Goupil**, Andrey Berenov, Neil McN. Alford "Chapter 6: Electrocaloric Bulk Materials: towards lead-free cooling electrocaloric materials" in *Electrocaloric Materials: New Generation of Coolers*. Editors T. Correia, Q. Zhang, Eds Springer (2013)

Key Conference Contributions

Invited oral presentations:

- 1) **Florian Le Goupil**, Andrey Berenov, Neil McN. Alford "Enhanced Electrocaloric Effect in Lead-Free Ceramics with Critical Points." Winton Meeting on Caloric Materials, 10-11 Feb 2016, Cambridge, UK.
- 2) **Florian Le Goupil**, Anna-Karin Axelsson "Novel Solid State Coolers - Electrocalorics", 20th January 2016, SIRACH Networking meeting on Domestic and Commercial Heating and Cooling, Woking, UK.
- 3) **Florian Le Goupil**, Neil McN. Alford "Enhanced Electrocaloric Effect in Lead-Free Ceramics with Critical Points" 16 June 2015, University of Nova Gorica, Nova Gorica, Slovenia.

Selected oral presentation:

- 4) **Florian Le Goupil**, *et al.* "All organic multilayer polymer systems for efficient energy storage." European Polymer Congress 2019, EPF 2019, 9-14 June, 2019, Hersonissos Heraklion Crete, Greece.
- 5) **Florian Le Goupil**, *et al.* "Electrocaloric effect in fluorinated polymer nanocomposites with various lead-free inorganic nanoparticles." ISAF-FMA-AMF-AMEC-PFM 2018, 27 May- June 1 2018, Hiroshima, Japan.
- 6) **Florian Le Goupil**, *et al.* "Efficient electrocaloric cooling through polymer nanocomposites with high dielectric strength." ISAF-IWATMD-PFM 2017, 7-11 May 2017, Georgia Institute of Technology, Atlanta, GA, USA.
- 7) **Florian Le Goupil**, *et al.* "Anisotropy of the Electrocaloric Effect in Lead-Free Relaxors." ISAF-IWATMD-PFM 2014, 12-16 May 2014, Penn State University, State College, PA, USA.
- 8) **Florian Le Goupil**, *et al.* "Anisotropy of the Electrocaloric Effect by Direct Measurements" ISAF-ECAPD-PFM 2012, 9-13 July 2012, Aveiro, Portugal.
- 9) **Florian Le Goupil**, *et al.* "Direct electrocaloric measurements in polar materials" ISAF-PFM 2011, 24-27 July, 2011, Vancouver, Canada.