Dr. Florent Pawula

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29 years old

Postdoctoral Fellow

Research Experience

Jan. 2019 – to date: **Postdoctoral position**, Laboratoire de Chimie des Polymères Organiques (**LCPO**) in Prof. Georges Hadziioannou's team, Université de Bordeaux, Bordeaux, FRANCE.

Polymer Thin Films and Hybrid Single Crystals for Thermoelectric Application

- Investigation of low T transport behavior of PEDOT:Tos. Vapor phase or in-situ polymerization. Thin films of tens to hundred nanometers thickness. Gold contact deposited by evaporation. Thermoelectric transport measurement from 2K to 350K.
- Investigation of low T transport behavior of hybrid halide perovskites for solar cell and thermoelectric applications. Single crystal synthesis by antisolvent vapor-assisted crystallization. Crystallochemistry characterizations by XRD and TEM (collaboration) and thermoelectric transport measurements from 2K to 350K.

Oct. 2015 – Sept. 2018: **PhD** in **Physics - Material Science**, supervisors Dr. Sylvie Hébert and Dr. Antoine Maignan (CNRS researchers), Cristallographie et Science des Matériaux (**CRISMAT**) laboratory, Université de Caen/CNRS/Ensicaen, FRANCE.

Ruthenium Oxides Peculiarities Probed by Seebeck Effect

- In metallic ruthenium oxides, transport coefficients such as the Seebeck effect S can be described considering a coexistence of metallic carriers together with localized magnetic moment contributions enhancing S. The aim of my PhD was to investigate the Seebeck coefficient in several ruthenium oxides presenting different electronic and magnetic backgrounds to better understand this coexistence effect. Different structures have been investigated: rutile, hollandites (quasi 1D), R-type ferrites (quasi 2D: Kagome) and perovskites (3D). These results have been compared to well known $SrRuO_3$ and Sr_2RuO_4 and provide evidence of high T Seebeck coefficient protected from band structure considerations in ruthenium oxides. During this work, I have synthesized samples by solid state reaction, determined their structure with X-ray diffraction and investigated their physical properties (magnetism and thermoelectric transport) with different techniques (cf. Skills section).

July – Aug. 2016: **Research Intern,** National Institute of Materials Science (**NIMS**) in Prof. Takao Mori's team, Tsukuba, JAPAN.

Thermal Properties of Dense Hollandites and 2D Chalcogenide Single Crystals

- Spark Plasma Sintering densification of oxide materials;
- Transport measurement from 2K to 800K (TTO PPMS & ZEM5);
- 5 probes carrier concentration measurement by Hall effect (ACT PPMS);
- Temperature/field-dependent magnetization measurement (MPMS);
- Development of thermal diffusivity measurement method by picosecond thermoreflectance (TDTR) on single crystal with front heating - front detection configuration.

May – Aug. 2015: **Research Intern,** Laboratory of Physical Chemistry of Matter (**LPCM**) of Prof. Armand Soldera, Université de Sherbrooke, Québec, CANADA.

Molecular Dynamic Modelization of Thermoelectric Polymer

- Investigation of PEDOT:PSS with calculation methodology developed at LPCM.

Jan. – Feb. 2014: **Research Intern,** laboratory of Materials, Components & Systems for Energy Efficiency (GREMAN), Université de Tours & STMicroelectronics, Tours, FRANCE.

Crystallochemistry analyses of the Multiferroic $GaFeO_3$ doped with Yb, Cr

Education

2015 – 2018: **PhD** in **Physics - Material Science**, CRISMAT laboratory, Université de Caen Normandie/Ensicaen, FRANCE.
2014 – 2015: **2nd cycle diploma Nanomatériaux & Caractérisation de pointe**, Université de Sherbrooke, Québec, CANADA.
2013 – 2015: **Master Multifunctional Materials & New Technologies for Energy** (head of the class), Université de Tours, FRANCE.
2013 – 2014: **Academic certificate: Entrepreneurship, Innovation & Strategy**, Université de Tours, FRANCE.
2009 – 2013: **Licence Science de la Matière (BSC)**, Université de Tours, FRANCE.

Publications & communications

- **Anisotropic thermal transport in magnetic intercalates Fe_xTiS_2**– F. Pawula, R. Daou, S. Hébert, D. Pelloquin , A. Maignan, A. Subedi, Y. Kakefuda, N. Kawamoto, T. Baba **Phys. Rev. B** 99 085422 (2019)
- **Two new magnetic hollandites $A_{1.5}Ru_{6.1}Cr_{1.9}O_{16}$ (A = Sr, Ba): magnetoresistance and thermopower** – F. Pawula, S. Hébert, D. Pelloquin & A. Maignan **J. Mater. Chem. C** 7, 86 (2019)
- **Thermoelectric properties beyond the standard Boltzmann model in oxides: A focus on the ruthenates** - F. Pawula, S. Hébert, R. Daou and A. Maignan. **Accepted book chapter**. (Book title: *Thermoelectric Energy Conversion: Theories and Mechanisms, Materials, Devices, and Applications*. Ed. Elsevier)
- **Ruthenium based R-type ferrite oxides $A_{1-\delta}M_{2+x}Ru_{4-x}O_{11}$ with A = Ba, Sr and M = Co, Mn & Fe: thermopower and density of state calculations** – F. Pawula, R. Daou, S. Hébert, D. Pelloquin, I. Mazin and A. Maignan. (to be submitted)

July 2018: **Oral presentation (international)**: International & European Conference of Thermoelectricty (ICT & ECT 2018), Caen, FRANCE.
- *The Seebeck coefficient in some Ru oxides – The example of hollandites* – F. Pawula, S. Hébert, D. Pelloquin & A. Maignan

December 2017: **Oral presentation (national):** Groupement d'Intérêt Scientifique Thermoélectricité (GIS), Montpellier, FRANCE.
- *The Seebeck Coefficient in Oxoruthenates* – F. Pawula, S. Hébert, D. Pelloquin & A. Maignan

October 2017: **Oral presentation (international)**: Research workshop on Spin, Charge and Energy Currents in Novel Materials, Hvar island, CROATIA.
- *The Seebeck Coefficient in Low Dimensional Ru Oxides* – F. Pawula, S. Hébert, D. Pelloquin & A. Maignan

Skills

Synthesis methods: **Solid state reaction** and **vapor transport reaction** (single crystal).
Characterization techniques: **DRX, Rietveld refinement, MPMS (Quantum Design) SQUID** magnetometer, **PPMS (QD)** Physical Properties MS **(resistivity ρ, Hall effect, AC Transport ρ, Thermal Transport Option** (ρ, S, thermal conductivity κ), **ACMS),** and **ZEM3** (S & ρ high T).
Computer: **OriginPro, Highscore, FullProf, LaTeX, Keynote, Omnigraffle,** notions of Python (Spyder) and Mathematica.
Languages: **French** (mother tongue), **English** (fluent) & Spanish (notions).

Referees

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