Dylan JOUGLARD

Doctor of Philosophy in Materials Science – Ceramics engineer

Research engineer - postdoctoral student applicant

PERSONAL DETAILS

Nationality: French

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LinkedIn Profile

Driving Licence

SKILLS

Languages

- French: Native speaker
- English: Fluent (TOEIC 855)
- Spanish: Intermediate
- Italian: Beginner
- Czech: Beginner
- Réunion creole: Beginner

Computing IT

- Microsoft Office
- OriginLab (scientific graphing and data analysis software)
- Labview, Scilab, SolidWorks, ANSYS (engineering simulation and computer-aided design (CAD) softwares)
- Matlab and Python (numerical computing environment)

INTERESTS

Sports (amateur level)

- Soccer player for 20 years
- Badminton /squash
- Hiking / running
- Cycling

Hobbies and activities

- Music (rock, RAP, popular French songs, …)
- Movies and series
- Board games
- Numismatic
- Travelling
- Gold panning
- Member of the organization committee of the soccer international tournament in Limoges : *"Lafarge Foot Avenir"*

PROFILE

Available immediately

Recently graduated with a PhD degree from the University of Orléans (France), I am looking for an attractive opportunity with a great willingness to continue in the material science field. From a ceramic engineer formation along with a strong experience in materials formulation and characterization, I am willing to relocation and open to get a position as a research engineer or a postdoctoral fellow in a dynamic laboratory or company.

Experimental techniques and expertise fields: Electrochemical impedance spectroscopy, scanning electron microscopy, glass formulation, X-ray diffraction, non-organic materials

EDUCATION

2015-2018 — **Orléans University - France**
Doctor of Philosophy in Materials Science, diploma awarded in November

2012-2015 — **Limoges University, *Ecole Nationale Supérieure de Céramique Industrielle (ENSCI)* - France**
Diploma of engineering school in ceramics, 2015

2010-2012 — **Limoges University institute of Technology - France**
Diploma of Institute of Technology (DUT) in Physical Measurements with specialty in materials and physicochemical controls, 2012

WORK EXPERIENCE

Scientific research experiences:

2015-2018 — Doctor of Philosophy in Materials Science, Orléans University – France:

Subject: Study of borosilicate glasses electrical and dielectrical properties (3 years)

The context of this study was part of the nuclear waste management especially at the vitrification step in a cold crucible induction melter process. This work was financially supported by CEA, Orano and EDF. This work was performed in the CEA Marcoule laboratories and the CEMTHI-CNRS in Orléans, France.

The studied materials during this work correspond to borosilicate glass samples used as matrices for conditioning fission products. Their electrical properties have been measured on a wide range of temperatures and frequencies by Eletrochemical Impedance Spectroscopy (EIS) and Atomic Force Microscopy (AFM) method and their microstructure has been investigated by X-ray diffraction and scanning electron microscopy technics. The aim of this study is to determine the relationship between the electrical properties and the microstructure or the chemical composition of the glasses by understanding the displacement of the charge carriers, mainly identified as the small cations such as Na^+ ions.

Thesis director
Mohammed Malki (CEMHTI)

Thesis advisors
Muriel Neyret (CEA)
-
Leire del Campo (CEMHTI)

2015 — Research intern at CEA Marcoule, Bagnols s/Cèze – France:

Subject: Study of the mechanisms involved in the formation of crystals incorporating chromium in glasses of nuclear interest (4 months)

The objective was to use a lattice design of experiments to study the glass composition influence, in terms of Fe_2O_3, ZnO, NiO and Cr_2O_3, on spinel group (AB_2O_4) formation. The design of experiments is composed of nine simplified mixtures of glasses. Each glass has followed the same heat treatment up to 1100°C and two samples, corresponding to two different cooling rates (one slow and one faster) have been collected. Both were compared by optical and scanning electron microscopy.

Supervisors
Hélène Nonnet & Lionel Campayo (CEA)

Supervisors
Sylvie Rossignol
(ENSCI)

After observing and recording sample images, Image-J software has been used to determine the crystallization ratio of each sample to identify the influence of the oxides in the formation of crystals incorporating chromium.

2015

Research engineer at the University of Chemistry and Technology (UCT), Prague – The Czech Republic:

Subject: Elastic properties of ceramics and refractories, including porous materials at high temperature (4 months)

Supervisors
Willy Pabst
&
Eva Gregorova
(UCT)
-
Claire Peyratout
(ENSCI)

This work consists in the investigation of elastic properties of multiphase silicate ceramics with varying porosity. Rectangular shape samples have been obtained by pressing mixtures of powders and fired at different temperature. Their phase composition has been determined via X-ray diffraction and it has been possible to calculate the theoretical density and Young's modulus from the volume fraction of each phase. The porosity and the bulk density have been obtained by Archimedes method and geometrical measurement. The Young's modulus at room temperature and its evolution during the thermal cycle have been determined by the impulse excitation method. The corresponding curves have revealed the influence of the phases on the Young's modulus (modification of the absolute value, evolution during the thermal cycle, hysteresis…). The relative Young's modulus has been compared with some prediction models such as Hashin-Shtrikmann and exponential ones.

2014

Research intern at Medtronic Sofamor Danek, Deggendorf – Germany:

Subject: Processing of unused powders for bone substitute manufacturing (4 months)

Supervisors
Vinzenz Frey
-
Claire Peyratout
(ENSCI)

During artificial spinal column bones production from ceramic raw materials, an important material quantity is lost, decreasing the yield of the production. The goal of this research internship was to find a way to recycle this lost material and to implement it again in the process. The main difficulty is to get the same quality of product as the first round and that meets the requirements in terms of porosity and biocompatibility.

A first improvement was to reduce the quantity of ceramic slurry required to impregnate a total of 15 polymer skeleton plates by impregnate more plates at once: 2 molds of 7 and 8 plates instead of 3 molds of 4 plates and one mold of 3 plates.

The second improvement was to modify the debinding temperature dwell to reduce the flakiness and fragility of the impregnated plates. With these modifications, the yield was improved up to 46.80% in the best case against an initial value of 36%.

2012

Research intern at Imerys Tableware France, Aixe-sur-Vienne - France:

Subject: Development of a vitreous base for glazed engobe coating on terra cotta roof tiles (3 months)

Supervisors
Mickaël
Caudoux
(Imerys)
-
Paule Denoirjean
(University)

The first goal of this study was to determine, thanks to a dilatometer, the thermal expansion coefficient of several glass frits (representing 80 to 90% of the glazed engobe present in the formulation) in order to compare them with some roof tiles 'ones also measured. These characterizations allowed us to know if it was possible to correctly enamel the roof tiles and prevent problems during the firing and cooling such as coating cracking or flaking.

Secondly, according to the results, we realized mixtures between frits to observe the thermal expansion coefficient's evolution and to be able to control this parameter.

Finally, we made different tests by spraying, on two kind of support, the solutions prepared at the laboratory. In a first time, we sprayed on roof tiles pieces coming from several customers and in a second time, on entire roof tiles directly produced in tilery plants.

Scientific events participation:

- XV International IUPAC Conference on High Temperature Materials Chemistry (HTMC-XV), March 29th to April 1st, 2016, Orléans - France
- VII International Congress on Ceramic (ICC7), June 17th to 21st, 2018, Iguazu Falls, Paraná State - Brazil

Scientific contributions:

- Electrical properties of borosilicate glasses melted by Cold Crucible Induction Melter (CCIM) technology, D. Jouglard, M. Neyret, L. del Campo and M. Malki, Poster presentation at the XV International IUPAC Conference on High Temperature Materials Chemistry (HTMC-XV), March 29th to April 1st, 2016, Orléans – France
- Electrical property investigations and microstructure characterization of a nuclear borosilicate glass ceramic, D. Jouglard, L. del Campo, M. Neyret and M. Malki, Article accepted in *Journal of Nuclear Materials*
- Electrical properties of borosilicate glasses melted by Cold Crucible Induction Melter (CCIM) technology, D. Jouglard, L. del Campo, M. Neyret and M. Malki, Oral presentation at the VII International Congress on Ceramic (ICC7), June 17th to 21st, 2018, Iguazu Falls, Paraná State - Brazil

Thesis Abstract:

The vitrification of high-level nuclear waste is an important step to master in order to ensure their immobilization. Since 2010, a cold crucible induction melter is used in the La Hague plant due to its advantages. This process is based on electromagnetic currents directly induced on the load of the crucible whose walls are water-cooled. Thanks to the thermal gradient established between these cooled walls and the molten glass, a solid glass layer called self-crucible is created which protects the crucible from corrosion effects and acts as an electrical insulator. Due to their complex composition and microstructure, the study of electrical and dielectric properties of nuclear glasses and the understanding of the related phenomena are necessary in order to efficiently master the cold crucible process and the associated thermo-hydraulic simulations.

This study is dealing with the description of the electric charge motion phenomena involving the electrical and dielectric properties of the nuclear borosilicate glasses. Relationships between these properties, the composition and the microstructure are also given. These issues are firstly broached through the investigation of two industrial inactive glasses of complex composition thanks to microstructure characterizations and complex impedance measurements in the solid-state. A more detailed description of the phenomena is performed thanks to the characterization of simplified glasses containing 5 oxides (SiO_2-B_2O_3-Na_2O-CaO -RuO_2 or -MoO_3) allowing a better understanding of the charge motion according to the electrical field frequency, the temperature, the composition and the microstructure of the material.

Contacts: Mohammed Malki: mohammed.malki@univ-orleans.fr (Thesis Director)
Muriel Neyret: muriel.neyret@cea.fr (Thesis Advisor)
Leire del Campo: leire.del-campo@cnrs-orleans.fr (Thesis Advisor)
Olivier Pinet: olivier.pinet@cea.fr (Head of laboratory)

Main scientific contributions of the laboratory:

A. Grandjean, et al., Effect of composition on ionic transport in SiO_2-B_2O_3-Na_2O glasses, J. Non-Cryst. Solids 352 (26-27) (2006) 2731-2736.

C. Simonnet, et al., Electrical conductivity measurements of oxides from molten state to glassy state, Rev. Sci. Instrum. 74 (5) (2003) 2805-2810.

R. Pflieger, et al., Behaviour of ruthenium dioxide particles in borosilicate glasses and melts, J. Nucl. Mater. 389 (3) (2009) 450-457.

R. Pflieger, et al., Electrical conductivity of RuO_2-borosilicate glasses: effect of the synthesis route, J. Am. Ceram. Soc. 92 (7) (2009) 1560-1566.

C. Simonnet, et al., Electrical behavior of platinum-group metals in glass forming oxide melts, J. Nucl. Mater. 336 (2-3) (2005) 243-250.

L. Jacoutot, et al., Strategy of coupling to model physical phenomena within molten glass bath heated by direct induction, Compel-the Int. J. Comput. Math. Electr. Electron. Eng. 27 (2) (2008) 369-376.

E. Sauvage, et al., Numerical simulation of vitrification processes: glass homogeneity by gas bubbling study, Procedia Chemistry 7 (2012) 593-598.

N. Chouard, et al., Effect of MoO_3, Nd_2O_3 and RuO_2 on the crystallization of soda-lime aluminoborosilicate glasses, 2014.

N. Chouard, et al., Effect of neodymium oxide on the solubility of MoO_3 in an aluminoborosilicate glass, J. Non-Cryst. Solids 357 (14) (2011) 2752-2762.

M. Neyret, et al., Ionic transport of alkali in borosilicate glass. Role of alkali nature on glass structure and on ionic conductivity at the glassy state, J. Non-Cryst. Solids 410 (Supplement C) (2015) 74-81.

S. Schuller, et al., Liquid-liquid phase separation process in borosilicate liquids enriched in molybdenum and phosphorus oxides, J. Am. Ceram. Soc. 94 (2) (2011) 447-454.

O. Pinet, et al., Redox - Behavior of platinum-group metals in nuclear glass, Journal of Non-Crystalline Solids, 355 (3) (2009), 221-227.

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