

Carole Nisr

Curriculum Vitae

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Degrees

- 2011 **Ph.D. Mineral/Material physics**, Unité Matériaux Et Transformations, Université Lille 1, France (defended on December 1st). Advisors: Professors Sébastien Merkel and Patrick Cordier.
- 2008 **M.S. Materials Physics**, Université Lille 1, France.
- 2007 **M.S. Physics**, Université Lille 1, France.
- 2006 **B.S Physics**, Université Lille 1, France.

Teaching

- 2020- **Phoenix College**
University Physics 121; 131
- 2008-2011 **Telecom Lille, Engineering school, (B.S.)**
College and University Physics I, II, III: Electrokinetics; Vibration and waves; Mechanics; Physics of semiconductors.

Research Interests

- In Situ high pressure and temperature synchrotron X-ray diffraction experiments using diamond anvil cells.
- Phase transitions, equations of state and plastic properties at high pressure-temperature of wide range of mineralogical compositions of the interior of the earth and other planets.
- Effect of water on the compressional behavior of Earth minerals.
- 3D X-ray diffraction to extract single grains within a polycrystalline sample.
- Stress, strain and textures analysis from X-ray diffraction images.
- Study of dislocations using the X-ray Line Profile Analysis.

Research Experiences

- 2018- **Visiting Research Scientist**, School of Earth and Space Exploration, Arizona State University, USA.
- 2016-2018 **Assistant Research Scientist**, School of Earth and Space Exploration, Arizona State University, USA.
- 2012-2016 **Postdoctoral Researcher**, School of Earth and Space Exploration, Arizona State University, USA.
- 2008-2011 **Ph.D. Mineral physics**, "*In situ characterization of dislocations in high pressure minerals*", Unité Matériaux Et Transformations, Université Lille 1, France.
- 2008-2011 **Balaton project**, "*X-ray Line Profile Analysis*", Collaboration with Tamas Ungar and Gabor Ribarik, Eötvös Lorand University, department of materials physics, Budapest, Hungary.
- 2007-2008 **M.S. Research Intern**, "*Texture and phase transformation in iron up to 50 GPa deformed in Diamond anvil cell*" Université Lille 1, France.

Trainings & Workshops

- May 22-23, 2018 **Synchrotron Infrared Spectroscopy on Materials in Extreme Environments**, Brookhaven National Laboratory, Upton, NY, USA
- Oct. 28-29, 2016 **Workshop on high-pressure multigrain crystallography**, Argonne National Laboratory, Argonne, IL, USA
- Nov 2-4, 2012 **Workshop on Data Evaluation using CONUSS and PHOENIX**, Argonne National Laboratory, Argonne, IL, USA
- June 4-14, 2009 **41st Crystallography Course**: High pressure crystallography, *Erice, Italy*
- April 6-8, 2009 **XLPA Course**: X-ray Line Profile Analysis school, *Budapest, Hungary*
- Oct 12-17 2008 **Physics school of "les Houches"**: Structure and dynamics of the deep mantle, "les Houches", France

Technical skills

- In situ synchrotron X-ray diffraction (XRD) measurements.
- Laser heated diamond anvil cell.
- Multi anvil press
- Phase transitions; equation of state.
- Plastic deformation; stress, strain, textures and dislocations.
- Crystal structure refinement using the Rietveld method.
- Raman spectroscopy.
- Fourier Transform Infrared Spectroscopy (FTIR).
- Secondary Ion Mass Spectrometry (SIMS).
- Scanning Electron Microscopy (SEM).
- Transmission Electron Microscopy (TEM).
- Basic programming knowledge with python, Matlab and IDL; Linux, windows and Mac OS X.

Publications

Articles:

C. Nisr, S.-H. Dan Shim and K. Leinenweber. Infrared Spectroscopy of hydrous stishovite and dense high pressure silica up to 41 GPa. *In preparation*.

C. Nisr, H. Chen, K. Leinenweber, A. Chizmeshya, V. Prekapenka, C. Prescher, S. Tkachev, Y. Meng, Z. Liu, and S.-H Dan Shim. Geophysical implications of dense polymorphs in $\text{Si}_{1-x}\text{H}_{4x}\text{O}_2$. *Under Review, PNAS*.

H. Chen, S.-Y. Xie, B. Ko, T. Kim, **C. Nisr**, V. Prekapenka, E. Greenberg, D. Zhang, W. Bi, E.E. Alp, Y. Lee, and S.-H Dan Shim. A New Iron Hydroxide Phase Stable in Hydrous Lower-Mantle Systems. *Submitted, Nature Comm*.

C. Nisr, S.-H Dan Shim and K. Leinenweber. Raman spectroscopy of water-rich stishovite and dense high-pressure silica up to 55 GPa. *American Mineralogist*, 102, 2017, doi:[10.2138/am-2017-5944](https://doi.org/10.2138/am-2017-5944).

C. Nisr, K. Leinenweber, V. Prekapenka and C. Prescher, S. Tkachev and S.-H Dan Shim. Phase Transition and Equation of State of Dense Hydrous Pure up to 63 GPa, *J. Geophys. Res.: Solid Earth*, 122, 2017, doi:[10.1002/2017JB014055](https://doi.org/10.1002/2017JB014055).

C. Langrand, N. Hilairret, **C.Nisr**, M. Roskoz, G. Ribarik, G. Vaughan and S. Merkel. Reliability of multigrain indexing for orthorhombic polycrystals above 1Mbar:

application to MgGeO₃ post-perovskite. *J. Appl. Cryst.*, 50, 2017, doi:[10.1107/S1600576716018057](https://doi.org/10.1107/S1600576716018057).

C. Nisr, Y. Meng, A. MacDowell, J. Yan, V. Prekapenka and S.-H Dan Shim. Thermal expansion of SiC at high pressure-temperature and implications for thermal convection in the deep interiors of carbide exoplanets. *J. Geophys. Res.: Planets*, 122, 2017, doi:[10.1002/2016JE005158](https://doi.org/10.1002/2016JE005158).

C. Nisr, G. Ribarik, T. Ungar, G. Vaughan and S. Merkel, Three dimensional x-ray diffraction in the diamond anvil cell: application to stishovite. *High Pressure Research*, 34, 158-166, 2014, doi:[10.1080/08957959.2014.885021](https://doi.org/10.1080/08957959.2014.885021).

A. D. Rosa, C. Sanchez-Valle, C. Nisr, S. R. Evans, R. Debord and S. Merkel, Shear wave anisotropy in textured phase D and constraints on deep water recycling in subduction zones. *Earth Planet. Sc. Lett.* 377-378, 13-22, 2013, doi:[10.1016/j.epsl.2013.06.036](https://doi.org/10.1016/j.epsl.2013.06.036).

C. Nisr, G. Ribarik, T. Ungar, G. Vaughan, P. Cordier and S. Merkel, High resolution three-dimensionnal X-ray diffraction study of dislocations in grains of MgGeO₃ post-perovskite at 90 GPa. *J. Geophys. Res.* 117, B03201, 2012, doi:[10.1029/2011JB008401](https://doi.org/10.1029/2011JB008401).

Abstracts:

C. Nisr, S.-H Dan Shim, K. Leinenweber and A. Chizmeshya. Raman spectroscopy of water-rich stishovite and dense high-pressure silica up to 55 GPa. *American Geophysical Union fall meeting: New Orleans, LA, USA, December 11-15, 2017*.

C. Nisr, S.-H Dan Shim, K. Leinenweber, R. Hervig, V. Prekapenka, Y. Meng and Z. Liu. Equation of State of Hydrous Silica, Si_{0.954}O₂H_{0.184}, up to 63 GPa. *American Geophysical Union fall meeting: San Francisco, CA, USA, December 14-18, 2015*.

S.-H Dan Shim, C. Nisr, M. Pagano, H. Chen, B. Ko, S. Noble, K. Leinenweber, P. Young and S. Desh. Un-Earth-like interiors of the Earth-like planets. *American Geophysical Union fall meeting: San Francisco, CA, USA, December 14-18, 2015*.

S.-H Dan Shim, C. Nisr, H. Chen, B. Ko, M. Pagano, S. Desh and P. Young. Un-Earth-like interiors of the Earth-like planets. *Comparative Tectonics and Geodynamics of Venus, Earth, and Rocky Exoplanets: Pasadena, CA, USA, 2015*.

C. Nisr, S.-H Dan Shim, K. Leinenweber, R. Hervig, V. Prekapenka, Y. Meng and Z. Liu (2014). Water in dense pure SiO₂ polymorphs up to 70 GPa and 2000 K. *American Geophysical Union fall meeting: San Francisco, CA, USA, December 15-19, 2014*.

S. Merkel, A. Lincot, **C. Nisr**, M. Hanfland and A. Zerr. Shear deformation of Fe polycrystals in the rotational diamond anvil cell. *American Geophysical Union fall meeting: San Francisco, CA, USA, December 15-19, 2014.*

C. Nisr, S.-H Dan Shim and V. Prakapenka. Thermal expansion of SiC in the deep interiors of carbide exoplanets. *Search for life beyond the solar system: Exoplanets, Biosignatures & Instruments: Tucson, AZ, USA, March 16-21, 2014.*

C. Nisr, S.-H. D. Shim, K. Leinenweber and V. Prakapenka. Effect of water on the compressional behaviors of SiO₂ stishovite up to 30 GPa. *American Geophysical Union fall meeting: San Francisco, CA, USA, December 9-14, 2013.*

S. Merkel, **C. Nisr**, G. Ribarik, T. Ungar, G. Vaughan and P. Cordier. Application of Line Profile Analysis for the study of dislocations in deep earth minerals. *TMS: San Antonio, TX, USA, March 3-7, 2013.*

S. Merkel, **C. Nisr**, G. Vaughan, G. Ribarik, T. Ungar and P. Cordier. 3D X-Ray diffraction in the diamond anvil cell. *EMC2012, Francfort, Germany, Septembre 2-6, 2012.*

S. Merkel, **C. Nisr**, G. B. M. Vaughan, G. Ribárick, T. Ungár and P. Cordier. 3D X-Ray diffraction and in-situ microstructural studies in the diamond anvil cell. *Gordon Research Conference on Research at high pressure, Biddeford, ME, USA, June 24-29, 2012.*

S. Merkel, **C. Nisr**, G. Vaughan, G. Ribarik, T. Ungar and P. Cordier. 3-D X-ray diffraction in the diamond anvil cell: Tracking single grains above 100 GPa. *American Geophysical Union fall meeting: San Francisco, CA, USA, December 4-9, 2011.*

S. Merkel, **C. Nisr**, G. Ribarik, T. Ungar, G. Vaughan and P. Cordier. In situ experimental study of dislocations in minerals at high pressure GPa. *American Geophysical Union fall meeting: San Francisco, CA, USA, December 4-9, 2011.*

S. Merkel, **C. Nisr**, P. Cordier, G. Ribarik, T. Ungar and G. Vaughan. In situ 3D X-ray diffraction study of stresses and dislocations in polycrystals under high pressure: application to MgGeO₃ post-perovskite at 80 GPa. *MecaSens: Hamburg, Germany, September 7-9, 2011.*

C. Nisr, S. Merkel, P. Cordier, G. Ribarik, T. Ungar and G. Vaughan. High resolution three-dimensionnal X-ray diffraction study of dislocations in grains of MgGeO₃ post-perovskite at 90 GPa. *Plasticity conference: Lille, France, April 4-6, 2011.*

G. Ribarik, **C. Nisr**, T. Ungar, G. B. M. Vaughan, P. Cordier, S. Merkel. Microstructure of MgGeO₃ post-perovskite at 90 GPa determined by 3D X-ray diffraction. *TMS Annual Meeting & Exhibition: San Diego, CA, USA, February 2 –March 3, 2011.*

A. D. Rosa, C. Sanchez-Valle, **C. Nisr**, C. Bollinger and S. Merkel. Deformation mechanisms in phase D to 45 GPa and implications for the seismic anisotropy in deep subducted slabs. *American Geophysical Union fall meeting: San Francisco, CA, USA, December 13-17, 2010.*

C. Nisr, G. Ribarik, T. Ungar, G. Vaughan, P. Cordier and S. Merkel. Experimental study of dislocations in grains of MgGeO₃ post-perovskite at 90 GPa. *American Geophysical Union fall meeting: San Francisco, CA, USA, December 13-17, 2010.*

S. Merkel, **C. Nisr**, G. Ribarik, T. Ungar, G. Vaughan and P. Cordier. A new method for the experimental study of dislocations in high pressure minerals. *American Geophysical Union fall meeting: San Francisco, CA, USA, December 13-17, 2010.*

C. Nisr, G. Ribarik, T. Ungar, G. Vaughan, P. Cordier and S. Merkel. Experimental study of dislocations in MgGeO₃ post-perovskite at 90 GPa. *Gordon Research Conference on Research at High Pressure: Massachusetts, NH, USA, June 27–July 2, 2010.*

C. Nisr, G. Ribarik, T. Ungar, G. Vaughan, P. Cordier and S. Merkel. X-Ray line profile analysis of MgGeO₃ post-perovskite deformed at 90 GPa and studied using three dimensional X-ray diffraction. *XIII International Conference on Experimental Mineralogy Petrology Geochemistry: Toulouse, France, April 12-14, 2010.*

C. Nisr, G. Ribarik, T. Ungar, G. Vaughan, P. Cordier and S. Merkel. Three dimensional X-ray diffraction study of MgGeO₃ post-perovskite plastically deformed at 90 GPa. *XLVII European High Pressure Research Group Meeting: Paris, France, September 6-11, 2009.*

C. Nisr and S. Merkel. In situ observation of iron properties up to 50 GPa deformed in Diamond Anvil Cell with synchrotron radiation X-Rays. *41st Crystallography Course: Erice, Italy, June 4-14, 2009.*