

Siobhan A. (Sasha) Wilson

Position/Department/Division/Institution/Organization

Associate Professor & Canada Research Chair in Biogeochemistry of Sustainable Mineral Resources, Department of Earth & Atmospheric Sciences, University of Alberta

Country

Canada

Career history

- 2018–Current Associate Professor & Canada Research Chair, University of Alberta
- 2016–2017 Senior Lecturer, Monash University
- 2015–2017 Australian Research Council Discovery Early Career Researcher Award (DECRA) Fellow, Monash University
- 2011–2015 Lecturer, Monash University
- 2010–2011 NASA Astrobiology Institute Postdoctoral Fellow, Indiana University

Awards/Publications

Selected Awards

- 2019 ICEF Top 10 Innovation (hydrotalcite supergroup minerals for CO₂ removal)
- 2017 Mineralogical Association of Canada Young Scientist Medal
- 2016 E.S. Hills Medal from the Geological Society of Australia
- 2014 Monash Faculty of Science Excellence in Research by an Early Career Researcher Award
- 2007 Edward H. Kraus Crystallographic Research Award from the Mineralogical Society of America

Peer-Reviewed Journal Articles

66. Hamilton, J.L., Wilson, S.A., Turvey, C.C., Morgan, B., Tait, A.W., McCutcheon, J., Fallon, S.J., and Southam, G. (2021) Carbon accounting of mined landscapes and deployment of a geochemical treatment system for enhanced weathering at Woodsreef Chrysotile Mine, NSW, Australia. *Journal of Geochemical Exploration*, 220, 106655.

<https://www.doi.org/10.1016/j.gexplo.2020.106655>

65. Barker, R.D., Barker, S.L.L., Wilson, S.A., and Stock, E. (2021) Quantitative mineral mapping of drill-core surfaces I: A method for μ XRF mineral calculation and mapping of hydrothermally altered, fine-grained sedimentary rocks from a Carlin-type gold deposit.

- Economic Geology, 116, 803–819. <https://doi.org/10.5382/econgeo.4803>
64. Maynard-Casely, H.E., Brand, H.E.A., Wilson, S.A., and Wallwork, K.S. (2021) Mineral diversity on Europa: Exploration of phases formed in the $\text{MgSO}_4\text{--H}_2\text{SO}_4\text{--H}_2\text{O}$ ternary. *ACS Earth and Space Chemistry*, 5, 1716–1725. <https://doi.org/10.1021/acsearthspacechem.1c00073>
63. Oskierski, H.C., Turvey, C.C., Wilson, S.A., Dlugogorski, B.Z., Altarawneh, M., and Mavromatis, V. (2021) Mineralisation of atmospheric CO_2 in hydromagnesite in ultramafic mine tailings – insights from Mg isotopes. *Geochimica et Cosmochimica Acta*, 309, 191–208. <https://doi.org/10.1016/j.gca.2021.06.020>
62. Swaren, L., Hao, W., von Gunten, K., Wilson, S.A., Alessi, D.S., Planavsky, N., Tarhan, L., Gingras, M.K., and Konhauser, K.O. (2021) The influence of invertebrate faecal pellets on compositional heterogeneity, diagenesis, and trace metal distribution in the Ogeechee River Estuary, Georgia, USA. *Sedimentology*, 68, 788–804. <https://www.doi.org/10.1111/sed.12807>
61. Paulo, C., Power, I.M., Stubbs, A.R., Wang, B., Zeyen, N., and Wilson, S.A. (2021) Evaluating feedstocks for carbon dioxide removal by enhanced rock weathering and CO_2 mineralization. *Applied Geochemistry*, 129, 104955. <https://www.doi.org/10.1016/j.apgeochem.2021.104955>
60. McCutcheon, J., Lutz, S., Williamson, C., Cook, J.M., Tedstone, A.J., Vanderstraeten, A., Wilson, S.A., Stockdale, A., Bonneville, S., Anesio, A.M., Yallop, M.L., McQuaid, J.B., Tranter, M., and Benning, L.G. (2021) Mineral phosphorus drives glacier algal blooms on the Greenland Ice Sheet. *Nature Communications*, 12, 570. <https://www.doi.org/10.1038/s41467-020-20627-w>
59. Hao, W., Mänd, K., Swaren, L., Myers, K.D., Lalonde, S., Wilmeth, D.T., Van Zuilen, M., Wilson, S.A., Alessi, D.S., and Konhauser, K.O. (2021) Trace elemental partitioning in hydrothermal muds from the El Tatio Geyser Field, Chile. *Journal of Geophysical Research – Solid Earth*. <https://www.doi.org/10.1029/2020JB021422>
58. Hamilton, J.L., Wilson, S.A., Morgan, B., Harrison, A.L., Turvey, C.C., Paterson, D.J., Dipple, G.M., and Southam, G. (2020) Accelerating mineral carbonation in ultramafic mine tailings via direct CO_2 reaction and heap leaching with potential for base metal enrichment and recovery. *Economic Geology*, 115, 303–323. <https://www.doi.org/10.5382/econgeo.4710>
57. Tait, A.W., Gagen, E.J., Wilson, S.A., Tomkins, A.G., and Southam, G. (2020) Eukaryotic colonisation of micrometre-scale cracks in rocks: A ‘microfluidics’ experiment using naturally weathered meteorites from the Nullarbor Plain, Australia. *Astrobiology*, 20, 364–374. <https://www.doi.org/10.1089/ast.2019.2077>

56. Whitworth, A.J., Brand, H.E.A., Wilson, S.A., and Frierdich, A.J. (2020) Iron isotope geochemistry and mineralogy of jarosite in sulfur-rich sediments. *Geochimica et Cosmochimica Acta*, 270, 282–295. <https://www.doi.org/10.1016/j.gca.2019.11.029>
55. Tomkins, A.G., Genge, M.J., Tait, A.W., Alkemade, S.L., Langendam, A.D., Perry, P.V., and Wilson, S.A. (2019) High survivability of micrometeorites on Mars: sites with enhanced availability of limiting nutrients. *Journal of Geophysical Research – Planets*, 124, 1802–1818. <https://www.doi.org/10.1029/2019JE006005>
54. Egglseeder, M.S., Cruden, A.R., Tomkins, A.G., Wilson, S.A., Dalstra, H.J., Riellie, A., Li, C., Baumgartner, J., and Faivre, D. (2019) Tiny particles building huge ore deposits – particle-based crystallisation in banded iron formation-hosted iron ore deposits (Hamersley Province, Australia). *Ore Geology Reviews*, 104, 160–174. <https://www.doi.org/10.1016/j.oregeorev.2018.10.001>
53. Power, I.M., Harrison, A.L., Dipple, G.M., Wilson, S.A., Barker, S.L., and Fallon, S.J. (2019) Magnesite formation in playa environments near Atlin, British Columbia, Canada. *Geochimica et Cosmochimica Acta*, 255, 1–24. <https://www.doi.org/10.1016/j.gca.2019.04.008>
52. Turvey, C.C., Wilson, S.A., Hamilton, J.L., Tait, A.W., McCutcheon, J., Beinlich, A., Fallon, S.J., Dipple, G.M., and Southam, G. (2018) Hydrotalcites and hydrated Mg-carbonates as carbon sinks in serpentinite mineral wastes from the Woodsreef chrysotile mine, New South Wales, Australia: CO₂ availability controls carbonate mineralogy and efficiency of CO₂ air capture in mine tailings. *International Journal of Greenhouse Gas Control*, 79, 38–60. <https://www.doi.org/10.1016/j.ijggc.2018.09.015>
51. Turvey, C.C., Hamilton, J.L., and Wilson, S.A. (2018) Comparison of Rietveld-compatible structureless fitting methods for accurate quantification of carbon dioxide fixation in ultramafic mine tailings. *American Mineralogist*, 103, 1649–1662. <https://www.doi.org/10.2138/am-2018-6515>
50. Cumberland, S.A., Wilson, S.A., Etschmann, B., Kappen, P., Howard, D., Paterson, D., and Brugger, J. (2018) Rapid immobilisation of U(VI) by Eucalyptus bark: adsorption without reduction. *Applied Geochemistry*, 96, 1–10. <https://www.doi.org/10.1016/j.apgeochem.2018.05.023>
49. Hamilton, J.L., Wilson, S.A., Morgan, B., Turvey, C.C., Paterson, D., Jowitt, S.M., McCutcheon, J., and Southam, G. (2018) Fate of transition metals during passive carbonation of ultramafic mine tailings via air capture with potential for metal resource recovery. *International Journal of Greenhouse Gas Control*, 71, 155–167. <https://www.doi.org/10.1016/j.ijggc.2018.02.008>

48. Mervine, E.M., Wilson, S.A., Power, I.M., Dipple, G.M., Turvey, C.C., Hamilton, J.L., Vanderzee, S., Raudsepp, M., Southam, C., Matter, J.M., Kelemen, P.B., Stiefenhofer, J., Miya, Z., and Southam, G. (2018) Potential for offsetting diamond mine carbon emissions through mineral carbonation of processed kimberlite: An assessment of De Beers mine sites in South Africa and Canada. *Mineralogy and Petrology*, 112, 755–765.
<https://www.doi.org/10.1007/s00710-018-0589-4>
47. Southall, S.C., Micklethwaite, S., Wilson, S.A., and Friedrich, A.J. (2018) Changes in crystallinity and tracer-isotope distribution of goethite during Fe(II)-accelerated recrystallization. *ACS Earth and Space Chemistry*, 2, 1271–1282.
<https://www.doi.org/10.1021/acsearthspacechem.8b00100>
46. Egglseeder, M.S., Cruden, A.R., Tomkins, A.G., Wilson, S.A., and Langendam, A.D. (2018) Colloidal origin of microbands in banded iron formations. *Geochemical Perspectives Letters*, 6, 43–49. <https://www.doi.org/10.7185/geochemlet.1808>
45. King, P.L., Wheeler, V.W., Renggli, C.J., Palm, A.B., Wilson, S.A., Harrison, A.L., Morgan, B., Nekvasil, H., Troitzsch, U., Mernagh, T., Yue, L., Bayon, A., DiFrancesco, N.J., Baile, R., Kreider, P., and Lipiński, W. (2018) Gas–solid reactions: theory, experiments and case studies relevant to Earth and planetary processes. *Reviews in Mineralogy & Geochemistry*, 84, 1–56. <https://www.doi.org/10.2138/rmg.2018.84.1>
44. Tait, A.W., Wilson, S.A., Tomkins, A.G., Gagen, E.J., Fallon, S., and Southam, G. (2017) Evaluation of meteorites as habitats for terrestrial microorganisms: Results from the Nullarbor Plain, Australia, a Mars analogue site. *Geochimica et Cosmochimica Acta*, 215, 1–16. <https://www.doi.org/10.1016/j.gca.2017.07.025>
43. Turvey, C.C., Wilson, S.A., Hamilton, J.L., and Southam, G. (2017) Field-based accounting of CO₂ sequestration in ultramafic mine wastes using portable X-ray diffraction. *American Mineralogist*, 102, 1302–1310. <https://www.doi.org/10.2138/am-2017-5953>
42. Hebbard, E., Wilson, S.A., Jowitt, S.M., Tait, A.W., Turvey, C.C., and Wilson, H.L. (2017) Regrowth of arsenate–sulfate efflorescences on processing plant walls at the Ottery arsenic–tin mine, New South Wales, Australia: Implications for arsenic mobility and remediation of mineral processing sites. *Applied Geochemistry*, 79, 91–106.
<https://www.doi.org/10.1016/j.apgeochem.2017.01.015>
41. Jowitt, S.M., Wong, V.N.L., Wilson, S.A., and Gore, O. (2017) Critical metals in the critical zone: Controls, resources and future prospectivity of regolith-hosted rare earth elements. *Australian Journal of Earth Sciences*, 64, 1045–1054.
<https://www.doi.org/10.1080/08120099.2017.1380701>

40. McCutcheon, J., Turvey, C.C., Wilson, S.A., Hamilton, J.L., and Southam, G. (2017) Experimental deployment of microbial mineral carbonation at an asbestos mine: Potential applications to carbon storage and tailings stabilization. *Minerals*, 7, 191.
<https://www.doi.org/10.3390/min7100191>
39. Sharp, A.C., Evans, A.R., Wilson, S.A., and Vickers-Rich, P. (2017) First non-destructive internal imaging of *Rangaea*, an icon of complex Ediacaran life. *Precambrian Research*, 299, 303–308. <https://www.doi.org/10.1016/j.precamres.2017.07.023>
38. Tait, A.W., Gagen, E.J., Wilson, S.A., Tomkins, A.G., and Southam, G. (2017) Microbial populations of stony meteorites: substrate controls on first colonisers. *Frontiers in Microbiology: Extreme Microbiology*, 8, 1227.
<https://www.doi.org/10.3389/fmicb.2017.01227>
37. Siegrist, M., Southam, C., Bowman, G., Wilson, S.A., and Southam, G. (2017) Analysis of the potential for negative CO₂ emission mine sites through bacteria-mediated carbon mineralisation: Evidence from Australia. *Energy Procedia*, 114, 6124–6132.
<https://doi.org/10.1016/j.egypro.2017.03.1749>
36. Vickers-Rich, P., Soleimani, S., Farjandi, F., Zand, M., Linnemann, U., Hofmann, M., Wilson, S.A., Cas, R., and Rich, T.H. (2017) A preliminary report on new Ediacaran fossils from Iran. *Alcheringa*, 42, 230–243. <https://www.doi.org/10.1080/03115518.2017.1384061>
35. Hamilton, J.L., Wilson, S.A., Morgan, B., Turvey, C.C., Paterson, D., MacRae, C., McCutcheon, J., and Southam, G. (2016) Nesquehonite sequesters transition metals and CO₂ during accelerated carbon mineralization. *International Journal of Greenhouse Gas Control*, 55, 73–81. <https://doi.org/10.1016/j.ijggc.2016.11.006>
34. Tomkins, A.G., Bowlt, L., Genge, M., Wilson, S.A., Brand, H.E.A., and Wykes, J.L. (2016) Ancient micrometeorites suggestive of an oxygen-rich Archaean upper atmosphere. *Nature*, 533, 235–238. <https://doi.org/10.1038/nature17678>
33. McCutcheon, J., Wilson, S.A., and Southam, G. (2016) Microbially accelerated carbonate mineral precipitation as a strategy for *in situ* carbon sequestration and rehabilitation of asbestos mine sites. *Environmental Science & Technology*, 50, 1419–1427.
<https://doi.org/10.1021/acs.est.5b04293>
32. Islam, S., Haque, A., Wilson, S.A., and Ranjith, P.G. (2016) Time-dependent strength and mineralogy of lime-GGBS treated naturally occurring acid sulfate soils. *Journal of Materials in Civil Engineering*, 04015077.
[https://doi.org/10.1061/\(ASCE\)MT.1943-5533.0001333](https://doi.org/10.1061/(ASCE)MT.1943-5533.0001333)
31. Morgan, B., Wilson, S.A., Madsen, I.C., Gozukara, Y., and Habsuda, J. (2015) Increased

- thermal stability of nesquehonite ($\text{MgCO}_3 \cdot 3\text{H}_2\text{O}$) in the presence of humidity and CO_2 : Implications for low-temperature CO_2 storage. *International Journal of Greenhouse Gas Control*, 39, 366–376. <https://doi.org/10.1016/j.ijggc.2015.05.033>
30. Low, F., Kimpton, J., Wilson, S.A., and Zhang, L. (2015) Chromium reaction mechanisms for speciation using synchrotron *in-situ* high-temperature X-ray diffraction. *Environmental Science & Technology*, 49, 8246–8253. <https://doi.org/10.1021/acs.est.5b01557>
29. McCutcheon, J., Dipple, G.M., Wilson, S.A., and Southam, G. (2015) Production of magnesium-rich solutions by acid leaching of chrysotile: A precursor to field-scale deployment of microbially enabled carbonate mineral precipitation. *Chemical Geology*, 413, 119–131. <https://doi.org/10.1016/j.chemgeo.2015.08.023>
28. Wilson, S.A., Harrison, A.L., Dipple, G.M., Power, I.M., Barker, S.L.L., Mayer, K.U., Fallon, S.J., Raudsepp, M., and Southam, G. (2014) Offsetting of CO_2 emissions by air capture into mine tailings at the Mount Keith Nickel Mine, Western Australia: Rates, controls and prospects for carbon neutral mining. *International Journal of Greenhouse Gas Control*, 25, 121–140. <https://doi.org/10.1016/j.ijggc.2014.04.002>
27. Power, I.M., Wilson, S.A., Harrison, A.L., Dipple, G.M., McCutcheon, J., Southam, G., and Kenward, P.A. (2014) A depositional model for hydromagnesite–magnesite playas. *Sedimentology*, 61, 1701–1733. <https://doi.org/10.1111/sed.12124>
26. Islam, S., Haque, A., and Wilson, S.A. (2014) Effects of curing environment on the strength and mineralogy of lime-GGBS treated acid sulphate soils. *Journal of Materials in Civil Engineering*, 26(5), 1003–1008. [https://doi.org/10.1061/\(ASCE\)MT.1943-5533.0000887](https://doi.org/10.1061/(ASCE)MT.1943-5533.0000887)
25. Islam, S., Haque, A., Wilson, S.A., and Ranjith, P.G. (2014) Improvement of acid sulphate soils using lime activated slag. *Proceedings of the Institution of Civil Engineers – Ground Improvement*, 167, 235–248. <https://doi.org/10.1680/grim.12.00033>
24. Tait, A.W., Tomkins, A.G., Godel, B.M., Wilson, S.A., and Hasalova, P. (2014) Investigation of the H7 ordinary chondrite, Watson 012: Implications for recognition and classification of Type 7 meteorites. *Geochimica et Cosmochimica Acta*, 134, 175–196. <https://doi.org/10.1016/j.gca.2014.02.039>
23. Power, I.M., McCutcheon, J., Harrison, A.L., Wilson, S.A., Dipple, G.M., Kelly, S., Southam, C., Southam, G. (2014) Strategizing carbon-neutral mines: A case for pilot projects. *Minerals*, 4(2), 399–436. <https://doi.org/10.3390/min4020399>
22. Power, I.M., Wilson, S.A., and Dipple, G.M. (2013) Serpentinite carbonation for CO_2 sequestration. *Elements*, 9(2), 115–121. <https://doi.org/10.2113/gselements.9.2.115>

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20. Vickers-Rich, P., Ivantsov, A.Y., Trusler, P.W., Narbonne, G.M., Hall, M., Wilson, S.A., Greentree, C., Fedonkin, M.A., Elliott, D.A., Hoffmann, K.H., and Schneider, G. (2013) Reconstructing *Rangaea*: New discoveries from the Ediacaran of Southern Namibia. *Journal of Paleontology*, 87, 1–15. <https://doi.org/10.1666/12-074R.1>
19. Hall, M., Kaufman, A.J., Vickers-Rich, P., Ivantsov, A., Trusler, P., Linnemann, U., Hoffman, M., Elliott, D., Cui, H., Fedonkin, M., Hoffmann, K.-H., Wilson, S.A., Schneider, G., and Smith, J. (2013) Stratigraphy, palaeontology and geochemistry of the late Neoproterozoic Aar Member, southwest Namibia; Reflecting environmental controls on Ediacara fossil preservation during the terminal Proterozoic in African Gondwana. *Precambrian Research*, 238, 214–232. <https://doi.org/10.1016/j.precamres.2013.09.009>
18. Wilson, S.A. and Bish, D.L. (2012) Stability of Mg-sulfate minerals in the presence of smectites: Possible mineralogical controls on H₂O cycling and biomarker preservation on Mars. *Geochimica et Cosmochimica Acta*, 96, 120–133.
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17. Bea, S.A., Wilson, S.A., Mayer, K.U., Dipple, G.M., Power, I.M., and Gamazo, P. (2012) Reactive transport modelling of natural carbon sequestration in ultramafic mine tailings. *Vadose Zone Journal*, 11. <https://doi.org/10.2136/vzj2011.0053>
16. Mills, S.J., Whitfield, P.S., Kampf, A.R., Wilson, S.A., Dipple, G.M., Raudsepp, M., and Favreau, G. (2012) Contribution to the crystallography of hydrotalcites: the crystal structures of woodallite and takovite. *Journal of Geosciences*, 58, 273–279.
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15. Wilson, S.A. and Bish, D.L. (2011) Formation of gypsum and bassanite by cation-exchange reactions in the absence of free liquid H₂O: Implications for Mars. *Journal of Geophysical Research – Planets*, 116, E09010. <https://doi.org/10.1029/2011JE003853>
14. Wilson, S.A., Dipple, G.M., Power, I.M., Barker, S.L.L., Fallon, S.J., and Southam, G. (2011) Subarctic weathering of mineral wastes provides a sink for atmospheric CO₂. *Environmental Science & Technology*, 45, 7727–7736. <https://doi.org/10.1021/es202112y>
13. Power, I.M., Wilson, S.A., Dipple, G.M., and Southam, G. (2011) Modern carbonate microbialites from an asbestos open pit pond, Yukon, Canada. *Geobiology*, 9, 180–195.
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11. Schuiling, R.D., Wilson, S.A., and Power, I.M. (2011) Enhanced silicate weathering is not limited by silicic acid saturation. *Proceedings of the National Academy of Sciences of the U.S.A.*, 108, E41. <https://doi.org/10.1073/pnas.1019024108>
10. Mills, S.J., Whitfield, P.S., Wilson, S.A., Woodhouse, J.N., Dipple, G.M., Raudsepp, M., and Francis, C.A. (2011) The crystal structure of stichtite, re-examination of barbertonite and the nature of polytypism in MgCr hydrotalcites. *American Mineralogist*, 96(1), 179-187.
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9. Wilson, S.A., Barker, S.L.L., Dipple, G.M., and Atudorei, V. (2010) Isotopic disequilibrium during uptake of atmospheric CO₂ into mine process waters: Implications for CO₂ sequestration. *Environmental Science & Technology*, 44, 9522–9529.
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8. Mills, S.J., Wilson, S.A., Dipple, G.M., and Raudsepp, M. (2010) The decomposition of konyaite: Importance to carbon fixation in mine tailings. *Mineralogical Magazine*, 74, 903–917. <https://doi.org/10.1180/minmag.2010.074.5.903>
7. Whitfield, P.S., Davidson, I.J., Mitchell, L.D., Wilson, S.A., and Mills, S.J. (2010) Problem solving with the TOPAS macro language: Corrections and constraints in simulated annealing and Rietveld refinement. *Materials Science Forum*, 651, 11–25.
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6. Wilson, S.A., Raudsepp, M., and Dipple, G.M. (2009) Quantifying carbon fixation in trace minerals from processed kimberlite: A comparative study of quantitative methods using X-ray powder diffraction data with applications to the Diavik Diamond Mine, Northwest Territories, Canada. *Applied Geochemistry*, 24, 2312–2331.
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5. Wilson, S.A., Dipple, G.M., Power, I.M., Thom, J.M., Anderson, R.G., Raudsepp, M., Gabites, J.E., and Southam, G. (2009) Carbon dioxide fixation within mine wastes of ultramafic-hosted ore deposits: Examples from the Clinton Creek and Cassiar chrysotile deposits, Canada. *Economic Geology*, 104, 95–112.
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4. Power, I.M., Wilson, S.A., Thom, J.M., Dipple, G.M., Gabites, J.E., and Southam, G. (2009) The hydromagnesite playas of Atlin, British Columbia, Canada: A biogeochemical model for CO₂ sequestration. *Chemical Geology*, 260, 286–300.
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3. Mills, S.J., Groat, L.A., Wilson, S.A., Birch, W.D., Whitfield, P.S., and Raudsepp, M. (2008) Angastonite, $\text{CaMgAl}_2(\text{PO}_4)_2(\text{OH})_4 \cdot 7\text{H}_2\text{O}$, a new phosphate mineral from Angaston, South Australia. *Mineralogical Magazine*, 72, 1011–1020.
<https://doi.org/10.1180/minmag.2008.072.5.1011>
2. Power, I.M., Wilson, S.A., Thom, J., Dipple, G.M., and Southam, G. (2007) Biologically induced mineralization of dypingite by cyanobacteria from an alkaline wetland near Atlin, British Columbia, Canada. *Geochemical Transactions*, 8, article 13.
<https://doi.org/10.1186/1467-4866-8-13>
1. Wilson, S.A., Raudsepp, M., and Dipple, G.M. (2006) Verifying and quantifying carbon fixation in minerals from serpentine-rich mine tailings using the Rietveld method with X-ray powder diffraction data. *American Mineralogist*, 91, 1331–1341.
<https://doi.org/10.2138/am.2006.2058>

Areas of expertise

Carbon dioxide mineralization; carbon dioxide removal; crystallography; economic geology; geochemistry; mineralogy; sedimentology.