



**CHRISTOPHER ANTHONY ROGERS**

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**EDUCATION**

MSc (Geology), University of Windsor, Ontario, 1977.  
Thesis topic, 'The effect of de-icing agents on water adsorption phenomena in rock aggregates'

BSc. (Honours) Geology, University of Manchester, U.K., 1973

**EMPLOYMENT**

- 2008 - present Consulting activities related to location, selection and performance of aggregates in construction and petrographic examination of concrete
- 2018 Instructor "Earth Systems Science" at University of Toronto, Ontario.
- 2009 – 2014 Instructor of 'Geology for Engineers' at Ryerson University, Toronto, Ontario.
- 1990 - 2008 Manager, Soils and Aggregates Section, Engineering Materials Office, Ministry of Transportation, Ontario
- 1986 Secondment (6 months) to Swedish Highway Administration, Borlange, Sweden
- 1978 -1990 Petrographer, Soils and Aggregates Section, Engineering Materials Office, Ministry of Transportation, Ontario
- 1976 -1978 Materials Evaluation Geologist, Engineering Materials Office, Ministry of Transportation, Ontario
- 1974 Geologist (oil rigs), Aberdeen, Scotland
- 1971 Trainee Geologist, National Coal Board, Nottingham, England.

**PROFESSIONAL EXPERIENCE**

Since 1976 experience has been with a broad range of activities associated with the testing and evaluation of construction engineering materials. Emphasis has been on:

Evaluation of aggregate resources

Microscopic examination of concrete and aggregate

Assessment of quality and causes of deterioration of asphalt pavement and hydraulic cement concrete structures due to a variety of causes

## COMMITTEE MEMBERSHIPS

Past Chair (2014 - 2019) of Canadian Standards Association Committee on Concrete Materials and Construction (CSA - A23.1 & .2) and currently a member of various associated sub-committees as a 'consumer representative'.

Honorary member of ASTM Committee C9 (Concrete and Concrete Aggregates), and member of D4 (Road and Paving Materials) and various associated sub-committees.

## AWARDS

Presidents Medal, 1988, Road and Transportation Association of Canada for best technical paper presented at the annual conference, Halifax.

Presidents Medal, 1990, Transportation Association of Canada for the best technical paper presented at the annual conference, St Johns.

Award of Merit for outstanding contribution to furtherization of standardization in the field of development of alkali-aggregate reaction standards, Canadian Standards Association, 2001.

Distinguished Researcher Award, International Center for Aggregates Research, University of Texas, Austin, April, 2005.

ACI Wason medal for best paper published in ACI Journals in 2013 for paper entitled: "*Twenty-year field evaluation of alkali-silica reaction mitigation.*"

## SELECTED CONSULTING INVESTIGATIONS 2011 - 2020

Study of possible alkali-aggregate reaction in concrete floors in Hawaii;

Cause of excessive efflorescence in galleries of a dam in Indonesia;

Study of possible causes of deterioration of concrete bridges on M5 near Gloucester, UK;

Cause of damage to concrete dams in northern Saskatchewan;

Work for a number of clients on litigation associated with failure of concrete in Quebec due to iron sulphides (pyrrhotite) in the aggregate;

Aggregate prospecting, testing and selection for concrete dam on the Peace River, northern British Columbia;

Advice to quarry owners on selecting and optimizing aggregate extraction operations to provide aggregate suitable for use in concrete, rail ballast and other applications;

Study of possible alkali-carbonate rock reaction in precast concrete in USA;

Study of suitability of rock for use as aggregate from a proposed mine under Lake Ontario;

Study of concrete alleged to be damaged by alkali-silica reaction in Honduras.

## CHRISTOPHER ANTHONY ROGERS – SELECTED PUBLICATIONS, 1983 – 2019

Rogers, Chris, *Guide to some of the building stones at the University of Toronto*, 17th Euroseminar on Microscopy Applied to Building Materials, Toronto, 2019, pp. 9-32.

Rogers, Chris, *A mistaken case of ACR in precast concrete*, presentation to ACI conference, Quebec City, March 2019.

Logan, L., C. Rogers, B. Fournier, *Multi-laboratory study of proposed new test for determination of sulphide sulphur content of concrete aggregates*, CSA Group, Rexdale, Ontario, 19p., Jan. 2019.

Rogers, Chris, Medhat Shehata, *Evaluation and use of recycled concrete aggregate*, University of Minnesota, 67th Annual Concrete Conference, Dec 2017.

Rogers, Chris, Keynote address: *"Pioneers of concrete petrography in Canada"*, Proceedings International Cement Microscopy Association, Annual meeting, Toronto, April, 2017.

Shehata, M. H., Jagdat, S., Rogers, C., and Lachemi, M., *Long-term effects of different cementing blends on alkali-carbonate reaction*. ACI Materials Journal, 114(4), 661-672. 2017.

Katayama, T., V. Jensen, C.A. Rogers, *The enigma of the 'so-called' alkali-carbonate reaction*, Proceedings Institution Civil Engineers, Construction Materials 169, August 2016, 223-232.

Rogers, Chris, Karl Peterson, *Portlandite in concrete sand from Hawaii: Fact or fiction?* Proceedings International Cement Microscopy Association, Annual meeting, Lyon. April, 2016.

Shehata, M., S. Jagdat, M. Lachemi, C. Rogers, *Alkali-carbonate reaction: Mechanism and effects of cement alkali and supplementary cementing materials*, In Proceedings of the 15th International Conference on Alkali-Aggregate Reactivity in Concrete, San Paolo, Brazil, 2016.

Hooton, R. Doug, Chris Rogers, Carole Anne MacDonald, and Terry Ramlochan. *Twenty-year field evaluation of alkali-silica reaction mitigation*, ACI Materials Journal, Sept-October, 2013, pp. 539-548. Note: This paper was awarded the American Concrete Institute Wason medal (in 2015).

Fournier, B., C. Rogers, Carole Anne MacDonald, *Multi-laboratory study of concrete prism expansion tests at 38° and 60°C*, In Proceedings of the 14th International Conference on Alkali-Aggregate Reactivity in Concrete, Drimalas, T., Ideker J.H. and Fournier, B. Eds., Austin, Texas, May 2012, 10p.

Chris Rogers, Carole Anne MacDonald, *The geology, properties and field performance of alkali-aggregate reactive Spratt, Sudbury, and Pittsburg aggregate distributed by the Ontario Ministry of Transportation*, In Proceedings of the 14th International Conference on Alkali-Aggregate Reactivity in Concrete, Drimalas, T., Ideker J.H. and Fournier, B. Eds., Austin, Texas, May 2012, 10p.

Carole Anne MacDonald, Chris Rogers, Doug Hooton, *The relationship between laboratory and field expansion – observations at the Kingston exposure site for ASR after twenty years*, In Proceedings of the 14th International Conference on Alkali-Aggregate Reactivity in Concrete, Drimalas, T., Ideker J.H. and Fournier, B. Eds., Austin, Texas, May 2012, 10p.

Shehata, Medhat H., Waleed Mikhaeel, Mohamed Lachemi and Chris Rogers, *Preventive measures against expansion in concrete containing reactive recycled concrete aggregate*, In Proceedings of the 14th International Conference on Alkali-Aggregate Reactivity in Concrete, Austin, Texas, May 2012, 10p.

Thomas, Michael, R. Doug Hooton, Chris Rogers, and Benoit Fournier, *50 years old and still going strong – Fly ash puts paid to ASR*, Concrete International, January, 35-40, 2012.

Chris Rogers, *The micro-Deval abrasion test for assessing the quality of construction aggregates*, Proceedings of International seminar on some aspects of the petrology and climate on the behaviour of aggregates in pavements and concrete, Ingeominas and Geotechnical Society of Colombia, Bogota, Colombia, November 2010, 24p.

Medhat H. Shehata, Chris Christidis, Waleed Mikhael, Chris Rogers, Mohamed Lachemi, *Reactivity of reclaimed concrete aggregate produced from concrete affected by alkali-silica reaction*, Cement and Concrete Research, 40, 575-582, 2010.

Shehata, M., S. Jagbat, M. Lachemi, and C. Rogers, *Do supplementary cementing materials control alkali-carbonate reaction?*, Proceedings 17th Annual Symposium, Ed. D. Fowler and J. Allen, International Centre for Aggregate Research, University of Texas, Austin, May, 2009.

Chris Rogers, *The deterioration of an asphalt pavement runway due to wetting and drying deterioration of the aggregate – An experience from the Lesser Antilles*, Proceedings 17th Annual Symposium, Ed. D. Fowler and J. Allen, International Centre for Aggregate Research, University of Texas, Austin, May, 2009.

Chris Rogers, Tom Dziejewski, *Fine aggregate water absorption and density testing – effect of fines on results*, Canadian Technical Asphalt Association, proceedings 53<sup>rd</sup> Annual Conference, Saskatoon, Nov. 2008, pp. 190-209.

Benoit Fournier, Chris Rogers, *Multi-laboratory Study of the Accelerated Mortar Bar Test and Concrete Prism Expansion Tests at 38°C and 60°C*, Proceedings of the 13<sup>th</sup> International Conference on Alkali-Aggregate Reaction in Concrete, Trondheim. Norway, 2008.

Shehata, M., Christidis, C., Mikhael, W., Rogers, C. and Lachemi, M. *Reactivity of reclaimed concrete aggregate produced from concrete affected by alkali silica reaction*, Proceedings of the 13<sup>th</sup> International Conference on Alkali-Aggregate Reaction, Trondheim, Norway, 2008.

Shrestha, N., M. Shehata, S. Easa, S. Senior, C. Rogers and R. Essex, *Use of processed tear-off shingles to improve performance of road base materials*, Transportation Assoc. of Canada, Annual meeting, Toronto, 2008, 15p.

Hooton, R.D., C. Rogers, T. Ramlochan, *Preventive measures for alkali-silica reaction: The Kingston outdoor exposure site for ASR - after 16 years*, Ontario Ministry of Transportation, Materials Engineering and Research Office Report, MERO-031, 49p., June, 2008.

Chris Rogers and Bob Gorman, *A flakiness test for fine aggregate*, 16<sup>th</sup> Annual Symposium of International Center for Aggregate Research, Austin, Texas, May, 2008.

M. Vasavithasan and C. Rogers, *Aggregate and Soil Proficiency Sample Testing Program for 2007*, Ontario Ministry of Transportation, Materials Engineering and Research Office Report, MERO-028, 116p., January, 2008.

Shehata, M., Christidis, C., Rogers, C. and Lachemi, M. *Reclaimed concrete aggregate produced from old concrete affected by alkali silica reaction: Reactivity and preventive measures*, Canadian Civil Engineer, 10-12, winter 2007-08.

Chris Rogers and Steve Senior, *Experience with End-Result Specifications for Granular Base Aggregates in Ontario*; Canadian Journal of Civil Engineering, v. 34, pp. 1169-1179, 2007.

Thomas, Michael D. A., Benoit Fournier, Kevin J. Folliard, Medhat H. Shehata, Jason Ideker and Chris Rogers, *Performance Limits for Evaluating Supplementary Cementing Materials Using Accelerated Mortar Bar Test*, American Concrete Institute, Materials Journal, March-April, pp. 115-122, 2007. Note: This paper was the finalist for the American Concrete Institute Wason medal (March 2009).

Wilson, A. and C. Rogers. *Substituting Recycled Aggregates for Virgin Aggregates: Good roads, better value and best practices*, Ontario Hot Mix Producers Association Fall Seminar, December 7, 2006.

M. Vasavithasan, Chris A. Rogers, *Precision of Aggregate Test methods; does Laboratory Inspection Reduce Multilaboratory Variation?* Annual Symposium of International Center for Aggregate Research, Austin, Texas, April, 2006.

Doug Hooton, Chris Rogers and Terry Ramlochan, *The Kingston Outdoor Exposure Site for ASR - After 14 Years What Have We Learned?* In: Fournier, B (editor): Marc-André Bérubé Symposium on alkali-aggregate reactivity in concrete. 8<sup>th</sup> CANMET/ACI International Conference on Recent Advances in Concrete Technology May 31 - June 3, 2006, Montréal, Canada.

S. A. Senior, C. A. Rogers and K. E. Legault, 2005, *Determination of a Rock Bulking Factor for Highway Construction*, Proceedings of Highway Geology Symposium, Wilmington, North Carolina, May 4-6, pp. 225-241.

Michelle R. Nokken, R. D. Hooton, C.A. Rogers, 2004, *Measured Internal Temperatures in Concrete Exposed to Outdoor Cyclic Freezing*, Cement, Concrete and Aggregates, ASTM, June 04, Vol 26, No.1, pp. 26-32.

Chris Rogers, Bob Gorman, Becca Lane and Frank Marciello, 2004, *Pavement Surface Friction on Ontario Highways*, World Road Association (PIARC) 5th Symposium on Pavement Surface Characteristics, Toronto, June.

Chris Rogers, Bob Gorman, Becca Lane, 2003, *Skid-Resistant Aggregates in Ontario*, Ontario Ministry of Transportation, Materials Engineering and Research Office, Report Number MERO-005, 38p.

Chris Rogers, Becca Lane and Steve Senior, 2003, *The Micro-Deval Abrasion Test for Coarse and Fine Aggregate in Asphalt Pavement*, Proceedings of Annual Symposium of International Center for Aggregate Research, Austin, Texas, April.

Thomas, M. D. A., C. A. Rogers, R. F. Bleszynski, 2003, *Occurrences of thaumasite In laboratory and field concrete*, Cement and Concrete Composites, 23, pp. 1045-1050.

Gillott, J. E., C. A. Rogers, 2003, *The behaviour of silicocarbonatite aggregates from the Montreal area*, Cement and Concrete Research, 33, pp.471-480.

Bleszynski, Roland, R.D. Hooton, M.D.A. Thomas, and C.A. Rogers, *Durability of Ternary Blend Concrete with Silica Fume and Blast-Furnace Slag: Laboratory and Outdoor Exposure Site Studies*, American Concrete Institute Materials Journal, Sept/Oct, 2002, pp. 499-508.

Rogers, Chris, Bob Gorman, Becca Lane, 2001, *Skid-resistant aggregates in Ontario*, Canadian Technical Asphalt Association, Proceedings of the 46<sup>th</sup> Annual Conference, pp. 51-76, also presented at the International Centre for Aggregate Research annual symposium, Baltimore, April 2002.

Rogers, Chris, P. E. Grattan-Bellew, R. Doug Hooton, J. Ryell, and M. D. A. Thomas, 2000, *Alkali-aggregate reactions in Ontario*, Canadian Journal of Civil Eng., Vol 27, pp. 246-260.

Rogers, Chris, Becca Lane, Doug Hooton, 2000, *Outdoor exposure for validating the effectiveness of preventive measures for alkali-silica reaction*, Proceedings 11<sup>th</sup> International Conference on Alkali-Aggregate Reaction, Quebec, pub. by CANMET, Ottawa, pp. 743-752.

Hooton, D., C. R. Donnelly, B. Clarida, C. A. Rogers, 2000, *An assessment of the effectiveness of blast-furnace slag in counteracting the effects of alkali-silica reaction*, Proceedings 11<sup>th</sup> International Conference on Alkali-Aggregate Reaction, Quebec, pub. by CANMET, Ottawa pp. 1313-1322.

Fournier, B., M-A. Berube, Chris A. Rogers, 2000, *Canadian Standards Association (CSA) standard practice to evaluate potential alkali-reactivity of aggregates and to select preventive measures against alkali-aggregate reaction in new concrete structures*, Proceedings 11<sup>th</sup> International Conference on Alkali-Aggregate Reaction, Quebec, pub. by CANMET, Ottawa pp. 633-642.

Grattan-Bellew, P. E., Christopher A. Rogers, 2000, *Expansion due to alkali-carbonate reaction: Laboratory prognosis versus field experience*, Proceedings 11<sup>th</sup> International Conference on Alkali-Aggregate Reaction, Quebec, pub. by CANMET, Ottawa pp. 41-50.

Rogers, C. A., 1999; *Multi-Laboratory Study of the Accelerated Mortar Bar Test (ASTM C 1260) for Alkali-Silica Reaction*, Cement Concrete and Aggregates, vol. 21, No. 2, Dec., pp. 185-194.

Fournier, B., M-A. Berube, and C. Rogers, 1999; *Proposed Guidelines for the Prevention of Alkali-Silica Reaction in New Concrete Structures*, Transportation Research Record # 1668, pp. 48-53.

Rogers, C.A., 1998; *Canadian experience with the micro-Deval test for aggregates*, In Advances in Aggregates and Armourstone Evaluation, Geological Society, U.K., Engineering Geology Special Publications, 13, 139-147.

Thomas, M. D. A., Hooton, R. D., and Rogers, C. A., "*Prevention of Damage due to Alkali-Aggregate Reaction (AAR) in Concrete Construction - Canadian Approach*," Cement, Concrete and Aggregates, CCAGDP, Vol. 19, No. 1, 1997, pp. 26-30.

Rogers, C. A., M. D. A. Thomas, H. Lohse, 1997; *Thaumasite in Manitoba and Ontario, Canada*, 19th International Conference on Cement Microscopy, Cincinnati, April. pp. 306-319.

Rogers, C.A., 1996; *Multi-laboratory study of the accelerated mortar bar test for alkali-silica reaction*, Proceedings 10th International conference on Alkali-aggregate Reaction in Concrete, Melbourne.

Rogers, C.A., S.I. Szoke and R.G. Gorman, 1995; *Granular base failures in Low-Volume Roads in Ontario, Canada*, Proceedings Sixth International Conference on Low-Volume Roads, Transportation Research Board, Washington, D. C., Vol. 2, pp. 23-32.

Rogers, C.A., and S. Senior, 1995; *Predicting Aggregate Performance using the Micro-Deval Abrasion Test*, Proceedings 3rd Annual Symposium of the Centre for Aggregates Research, University of Texas, Austin, 13p.

Rogers, C. A., 1995; *Canadian Standard for Controlling Alkali-Aggregate Reaction*, Proceedings 3rd Annual Symposium of the Centre for Aggregates Research, University of Texas, Austin, 12p.

Hooton, R.D., and C.A. Rogers, 1995; *Determination of the slag and fly ash content in hardened concrete*, Cement, Concrete and Aggregates (ASTM), vol. 17, No. 1, pp. 56-61.

Afrani, I., C.A. Rogers, 1994; *The effects of different cementing materials and curing on concrete scaling*, Cement, Concrete and Aggregates (ASTM), Vol. 16, No. 2, pp. 132-139.

Bickley, J.A., J. Ryell, C. Rogers, R.D. Hooton, 1994; *Some characteristics of high strength concrete: Part 2*, Canadian Journal of Civil Engineering, 21, 1084-1087.

Gillott, J.E., and C. Rogers, 1994; *Alkali-aggregate reaction and internal release of alkalis*, Magazine of Concrete Research, 46, No. 167, June, 99-112.

Rogers, C.A., S. I. Senior, 1994; *Recent developments in physical testing of aggregates to ensure durable concrete*, "Advances in Cement and Concrete", Engineering Foundation Conference (ASCE), Durham, New Hampshire, July, 338-361.

Senior, S.A., S. I. Szoke. C.A. Rogers, 1994; *Ontario's experience with reclaimed materials for use as aggregates*, Proceedings International Roads Federation Congress, Calgary.

Rogers, C.A., and T. Tharmabala, 1993; *Alkali-silica reaction in prestressed concrete beams*, Proceedings 14th International Congress of the Precast Concrete Industry, Washington, D.C., U.S.A., 275-279.

Gillott, J.E., and C. Rogers, 1993; *Alkali-aggregate reactions and release of alkalis*, Presented at Symposium on Chemistry of Cementitious Materials, 76th Canadian Society for Chemistry Conference, Sherbrooke, PQ, Abstract 832.

Rogers, C.A., 1993; *Methods for determining the alkali content of Portland cement*, Presented at Symposium on Chemistry of Cementitious Materials, 76th Canadian Society for Chemistry Conference, Sherbrooke, PQ, Abstract 833.

Rogers, C.A., 1993; *Alkali-Aggregate Reactivity in Canada*; Cement and Concrete Composites, 15, 1 - 2, pp.13-20.

Rogers, C.A. and R.D. Hooton, 1992, *Comparison between Laboratory and Field Expansion of Alkali-Carbonate Reactive Concrete*, Proceedings 9th International Conference on Alkali-Aggregate Reaction in Concrete, London, Concrete Society, pp.877-884.

Hooton, R.D. and C.A. Rogers, 1992, *Development of the NBRI Rapid Mortar Bar Test Leading to its Use in North America*, Proceedings 9th International Conference on Alkali-Aggregate Reaction in Concrete,

London, Concrete Society, pp. 461-467. Also pub. in *Construction and Building Materials*, 1993, vol. 7, No 3, pp.145-148.

Bickley, J.A., J. Ryell, C.A. Rogers, and R.D. Hooton, 1991; *Some Characteristics of High Strength Structural Concrete*; *Canadian Journal of Civil Engineering*, vol. 18, pp.885-889.

Rogers, C.A. and R.D. Hooton, 1991; *Reduction in Mortar and Concrete Expansion with Reactive Aggregates Due to Alkali Leaching*; *Cement, Concrete and Aggregates*, ASTM, Vol. 13, No. 1, pp.42-49.

Rogers, C.A., M.L. Bailey, and B. Price, 1991; *Micro-Deval Test for Evaluating the Quality of Fine Aggregate for Concrete and Asphalt*; *Transportation Research Record* 1301, pp.68-76.

Senior, S.A. and C.A. Rogers, 1991; *Laboratory Tests for Predicting Coarse Aggregate Performance in Ontario*; *Transportation Research Record* 1301, pp.97-106.

Rogers, C.A. and T. Tharmabala, 1990; *Prestressed Concrete Members Affected by Alkali-Silica Reaction*, *Concrete International*, pp.35-39, August, 1990.

Hooton, R.D. and C.A. Rogers, 1989; *Evaluation of Rapid Test Methods for Detecting Alkali-Reactive Aggregates*; *Proceedings 8th Inter. Conference on Alkali-Aggregate Reaction*, Kyoto, Japan, p.439-444.

Rogers, C.A. and R.D. Hooton, 1989; *Leaching of Alkalies in Alkali-Aggregate Reaction Testing*; *Proceedings 8th International Conference on Alkali-Aggregate Reaction*, Kyoto, Japan, pp.327-332.

Rogers, C.A. and B. Chojnacki, 1987; *Destruction of Concrete Water Tanks in a Severe Climate Due to Ice Lensing*; *Katherine and Bryant Mather International Conference on Concrete Durability*; *American Concrete Institute, Special Publication, SP-100*, p.723-739.

Rogers, C.A. and E.R. Magni, 1987; *Assessment of Construction Aggregate Suitability of Rocks Underlying the Toronto Area*; *Ontario Ministry of Transportation, EM Report 83*, 38p.

Magni, E.R. and C.A. Rogers, 1986; *The Influence of the Alkali-Silicate Reaction on Structures in the Vicinity of Sudbury, Ontario*, *Proceedings of 7th International Conference on Alkali-Aggregate Reactions*, Ottawa, Noyes Publications, New Jersey, pp. 17-22.

Rogers, C.A., 1986; *Testing Canadian Aggregates for Alkali Reactivity*; *Proceedings of 7th International Conference on Alkali-Aggregate Reactions*, Ottawa, Noyes Publications, New Jersey,, pp. 259-263.

Rogers, C.A., 1986; *Evaluation of the Potential for Expansion and Cracking of Concrete Caused by the Alkali-Carbonate Reaction*; *Cement, Concrete and Aggregates*, ASTM, Summer, pp. 13-23.

Rogers, C.A., 1986; *Interlaboratory Study of the Concrete Prism Expansion Test for the Alkali-Carbonate Reaction*; *Proceedings of 7th International Conference on Alkali-Aggregate Reactions*, Ottawa, Noyes Publications, New Jersey,, pp. 270-274.

Rogers, C.A., 1986; *Alkali-Aggregate Reactions in Ontario*; *Proceedings of 7th International Conference on Alkali-Aggregate Reactions*, Ottawa, Noyes Publications, New Jersey, pp.5-9.



Rogers, C.A., 1983; *Search for Skid-Resistant Aggregates in Ontario*; Ontario Geological Survey, Miscellaneous Paper No. 114, pp.185-205.

Rogers, C.A., 1983; *Frost Action as the Cause of Dolostone Popouts in Asphalt, Kingston, Ontario*, Canadian Geotechnical Journal v.20, pp.542-546.

Rogers, C.A., 1980; *Search for Skid-Resistant Aggregates in Eastern Ontario - Interim Report*; Ontario Ministry of Transportation, EM Report 36.