

COVER IMAGE: The nickel mine of Tiebaghi is developed

on an ultrabasic massif in

Northern New Caledonia

A former chromium mine,

it is now mined for nickel silicate ores. Its mountaintop

location overlooks the New Caledonian lagoon listed

by UNESCO on the World

Heritage List. This illustrates

the development of a mining

activity in an environmentally

vulnerable situation. In the background, the Barrier Reef makes a clear boundary

between the lagoon and the

open Pacific Ocean. Рното

CREDIT: SOCIÉTÉ LE NICKEL.

Nouméa (New Caledonia)

Volume 13, Number 5 • October 2017

## **Mineral Resources** and Sustainability

**Guest Editor: Georges Calas** 



**Mineral Resources and Sustainable** Development Georges Calas



**How to Sustain Mineral Resources: Beneficiation and Mineral Engineering Opportunities** Johan P.R. De Villiers

**Responsible Sourcing of Critical Metals** 

Frances Wall, Alain Rollat, and Robert S. Pell

*Elements* is published jointly by the Mineralogical Society of America, the Mineralogical Society of Great Britain and Ireland, the Mineralogical Association of Canada, the Geochemical Society, the Clay Minerals Society, the European Association of Geochemistry, the European Association of Geochemistry, the International Association of GeoChemistry, the Société Française de Minéralogie et de Cristallographie, the Association of Applied Geochemists, the Deutsche Mineralogische Gesellschaft, the Società Italiana di Mineralogia e Petrologia, the International Association of Geoanalysts, the Polskie Towarzystwo Mineralogiczne (Mineralogical Society of Poland), the Sociedad Española de Mineralogía, the Swiss Society of Mineralogy and Petrology, the Meteoritical Society, and the Japan Association of Mineralogical Sciences. It is provided as a benefit to members of these societies.

Elements is published six times a year. Individuals are encouraged to join any one of the participating societies to receive Elements. Institutional subscribers to any of the following journals-American Mineralogist, Clay Minerals, Clays and Clay Minerals, Mineralogical Magazine, and The Canadian Mineralogist—also receive one copy of Elements as part of their 2017 subscription. Institutional subscriptions are available for US\$165 (US\$180 non-US addresses) a year in 2017. Contact the executive editor (jrosso. elements@gmail.com) for information.

Copyright 2017 by the Mineralogical Society of America

including translation to other languages, or by any means—graphic, electronic, or mechanical, including photocopying or information storage and retrieval systems—without written permission from the copyright holder is strictly prohibited.

Publications mail agreement no. 40037944

Printed in USA

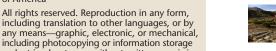
ISSN 1811-5209 (print) ISSN 1811-5217 (online)

elementsmagazine.org www.elements. geoscienceworld.org





Paper from responsible sources FSC® C006300





**Global Trends in Metal Consumption and Supply:** The Raw Material-Energy Nexus

Olivier Vidal, Fatma Rostom, Cyril François and Gael Giraud



Improving Mitigation of the Long-Term Legacy of Mining Activities: Nano- and Molecular-Level Concepts and Methods Gordon E. Brown Jr., Michael F. Hochella Jr., and Georges Calas



## **Educating the Resource Geologist of the Future: Between Observation and Imagination**

Michel Jébrak and Jean-Marc Montel

## DEPARTMENTS

<b>Editorial</b> – Mineral Resources and <i>The Limits to Growth</i>	291
From the Editors	292
Meet the Authors	294
Perspective – What is Sustainability in the Context	
of Mineral Deposits?	297
Society News	
Deutsche Mineralogische Gesellschaft	. 338
Clay Minerals Society	. 339
Société Française de Minéralogie et de Cristallographie	.340
International Association of GeoChemistry	
Association of Applied Geochemists	.342
Meteoritical Society	.344
Polskie Towarzystwo Mineralogiczne	.345
Mineralogical Association of Canada	.346
Mineralogical Society of America	
European Mineralogical Union	.350
Mineralogical Society of Great Britain and Ireland	
Japan Association of Mineralogical Sciences	
Geochemical Society	
European Association of Geochemistry	
Meeting Report – Goldschmidt 2017	356
<b>CosmoElements</b> – Search (and Discovery) of Impact Craters	
on Earth	358
Parting Shots – New Caledonia: Land of Nickel	360
Calendar	363
<b>People in the News</b> – Dingwell, Demouchy,	
IMA Mineral of the Year	
Job Posting – Simon Fraser University	368
Advertisers in this Issue	































