

# **Tenth International Heavy Minerals Conference (HMC 2016)**

**Expanding the Horizon**

**Sun City, South Africa  
16 – 17 August 2016**

ISBN: 978-1-5108-3199-5

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2016) by Southern African Institute of Mining & Metallurgy  
All rights reserved.

Printed by Curran Associates, Inc. (2016)

For permission requests, please contact Southern African Institute of Mining & Metallurgy  
at the address below.

Southern African Institute of Mining & Metallurgy  
P.O. Box 61127  
Marshalltown 2107  
South Africa

Phone: +27 (011) 834-1273/7  
Fax: +27 (011) 838-5923  
+27 (011) 833-8156

[www.saimm.co.za](http://www.saimm.co.za)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2633  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# Contents

Page No.

Naturally-occurring radioactive materials and the regulatory challenges to the zircon industry K. Harlow.....	1
The influence of trash minerals and conglomerate particles on spiral separation performance J.D. Grobler and J.H. Zietsman.....	9
Characterization of thin coatings on heavy minerals, with application to surface cleaning technologies A. Walliser and J. Grobler .....	25
Development of an enhanced heavy mineral spiral C. Ramotsabi .....	35
Fine chrome beneficiation and reverse PGM upgrade of existing slimes with vertical ring WHIMS technology W.P. Slabbert.....	49
Crude TiCl <sub>4</sub> purification: a review of the current state of the art and future opportunities L. Hockaday and A. Kale.....	63
The thermodynamic potential and reaction kinetics of synthetic rutile and other feedstocks during chlorination H. Kotze, N. Bernard, A. Kale, and T. Kekana .....	75
Monitoring lining wear on submerged arc furnaces P. Schmidt, M. Hopf, and D. Zeelie .....	93
Environment-friendly harvesting of heavy mineral deposits in India V. Subramanian, V. Velmurugan, and C. Swamydas .....	109
Design, construction, and commissioning of a heavy mineral sands concentrator pilot plant D. Nel .....	121
Sillimanite production from placer deposits: a new process C. Swamydas, A.D. Rajarethnam, and V. Velmurugan.....	135
Measurement of the variability of mineral band position on gravity spiral concentrator with a view to process control H.S. Baloyi, A.M. Russell, and D.N.C. Phillipotts .....	143
Prereduction and DC open-arc smelting of carbon-based ilmenite pellets K. Bisaka, I. Thobadi, and X. Goso .....	159
Online elemental analysis of rutile and zircon concentrates from mineral sands L. Koresaar.....	173
A case study of geotechnical characterization and 3D modelling of the biologically cemented Mandena heavy mineral sand deposit L.I. Boshoff, A.H. Bracken, and F. Hees .....	181
Gold and associated industrial heavy minerals in the icy Cape District: White River to Icy Cape, Alaska, USA K. Eden, A.E. Grosz, J.E. Grosz, C.J. Giles, and J.Y. Foley.....	195
Mineralogical, geochemical, and processing characteristics of heavy minerals sand deposits of Bangladesh and their commercial aspects E. Akon.....	207
Expanding the geotechnical horizon at the Zulti South heavy mineral deposit, South Africa P. de Kock, F. Hees, and A. Louw .....	221
Mine rehabilitation using <i>Eucalyptus</i> at the Tronox KZN Sands Hillendale mine, C. Smith, B. Cocks, J. Beukes, and M. Vlok .....	233
The effect of net positive suction head (NPSH) on pump and stacker cyclone performance, J.D. Singleton and L. Sarisar .....	243
Rare earths: applications, mineral resources, thorium, and the balance problem D. Kennedy and T. Blench .....	259
Solid-state reduction of an ilmenite concentrate with carbon A. Bhalla, C.S. Kucukkaragoz, and R.H. Eric.....	271
In-depth characterization and preliminary beneficiation studies of heavy minerals from beach sands in Brazil C.C. Gonçalves and P.F.A. Braga .....	289
Making test work dollars count G. Diener, S. Gilman, E. Williams, and G. Williams .....	303
Review of titanium feedstock selection for fluidized bed chlorinators A. Kale and K. Bisaka .....	313