

Chemical Engineering Seminars – MT 2011

*Week 4, Friday November 4th 2011, 11:30AM-12:30PM
Lecture Room 3, Thom Building, Engineering Science*

Mineral carbonation: a practical, and economically feasible carbon solution at scale.

Jim Petrie

Orica Mining Services & School of Chemical and Bio-molecular
Engineering, University of Sydney

Abstract

The sustainability of the minerals and metals sector will hinge on finding innovative solutions to the challenges of energy intensity and CO₂ management. This project champions the potential role of mineral carbonation in this regard - it is permanent, safe, readily auditable and thermodynamically favoured, and offers sufficient capacity to sequester all global anthropogenic emissions for many decades. Our focus has been on identifying (and quantifying) opportunities for increased energy efficiency within the process (at scale), starting with the chemistry route initially proposed by the Albany Research Center (ARC) in the USA. We have shown the need for large scale “carbon solutions” that might be shared by several co-located energy and carbon intensive industries. The mineral carbonation plant acts as a carbon sink at the heart of a minerals and energy complex, forming an industrial symbiosis, with low net CO₂ emissions. An illustrative case study has been constructed for such a system in Australia, supported by rigorous material and energy flow modeling of a serpentine carbonation process, and real cost data. The demonstrated synergies and added-value created have the potential to significantly offset the energy and emission penalties and direct costs of CO₂ capture and storage. This suggests that minerals and metals plants should consider closer integration with power production and energy provision plants, with mineral carbonation as a critical element of such integration. This has the capacity to radically alter the structure of resource-intensive industries and their value chains, in pursuit of genuine sustainable development and competitive advantage.

Bio

Jim Petrie is Emeritus Professor of Chemical Engineering at the University of Sydney, Australia. He is also Honorary Professor of Chemical Engineering at the University of Cape Town, South Africa; and Visiting Professor in the Centre for Environmental Strategy, University of Surrey, UK. Since 2008 he also operates as a development consultant from Cape Town, whilst continuing to devote the balance of his professional time to academic research and community outreach, and striving to reduce his carbon footprint. His research and consulting over the last 30 years have provided support to the primary industries and infrastructure sectors, including energy, minerals and metals, water and waste industries; and primarily in South Africa, Australia, and the UK. The scope of this work includes system-wide sustainability assessments, incorporating decision support frameworks and tools; technology development and commercialisation; environmental impact; life cycle management; and risk management. All of this activity is directed at the creation and operation of more sustainable practices within the public and private sectors. When not working, he likes to run in the hills, go sailing, and enjoy music. He and his wife, Gail, have been together a long time; about which their two adult children continually remind them in an effort to get them to behave more responsibly!