Sensor Technology for Sorting Waste Rock

Julie Hunt[1,2*] and Steve Walters[3] (and Bernd Lottermoser[4])

[1]CODES, The University of Tasmania, Hobart, Tasmania, 7001, Australia
[2] GeMMe, University of Liege, Liege, 4000, Belgium
[3]CRC ORE, The University of Queensland, Brisbane, Queensland, 4072, Australia
[4]Camborne School of Mines, University of Exeter, Penryn, Cornwall, UK TR10 9FE

*E-mail, julie.hunt@utas.edu.au

There are opportunities at each stage in a mining operation to exploit the known characteristics of rock being processed in order to divide the stream of material into accepted (i.e., economic) and rejected (i.e., uneconomic) flows. This provides the opportunity to characterize and sort not only ore but also waste material at each of these stages. For example, after waste material has been separated from ore it could potentially be further sorted into extremely acid generating, acid generating, non-acid generating or neutralizing, by adapting sensor-based on-belt technologies. This would allow more efficient environmental management of waste material in terms of deleterious components (i.e., acid rock drainage - ARD) and deleterious elements. It is important to separate these streams in terms of waste storage and encapsulation costs.

Sorting technology that is currently used in the coal, cement and fertilizer industry and/or new technology that is currently being developed may be suitable for sorting waste material produced in metalliferous mines via elemental analysis or mineralogy. Commercially available technology includesthe following: prompt gamma neutron activation analysis (PGNAA), laser induced breakdown spectrometry (LIBS), C and S at line analysis. New and emerging sensor technology includes magnetic resonance, gamma activation analysis and combine on line X-ray fluorescence and X-ray diffraction.

Ideally, any online sensing technology would measure bulk (not only surface) properties of the whole process stream, have a short measurement time, achieve the required resolution and detection criteria, be reliable and easy to calibrate. A review of existing and emerging technologies indicates that sorting waste material based on its acid generating capacity using the direct measurement of properties (e.g., S, Ca content) is possible, if the abundance (and range of abundance) of elements is sufficient. If the abundance of, for example S, is low it may be more difficult to get accurate direct measurements but instead be possible to identify a combination of proxy elements, i.e., elements typically found in sulfides (e.g. Fe, Co, Se) that are easier to measure and to sort waste material on this basis rather than on S or sulfide content.