Mobilisation of salts from mine waste. A pinch or a pound?

**Leach tests**

- **Test method**
  - Liquid to solid ratio (by mass)
  - USEPA 312: 20:1
  - DWAF (1999): 20:1
  - Price (1997): 3:1
  - Modified ASTM D3987: 4:1
  - Nevada Mining Association (1996): 1:1 (for crushed rock)

**South Africa**

- Semi-arid
- 600 mm to 700 mm rainfall per year
- Drainage salinity is of concern

- How should leach tests be used to assess the salinity load from gold tailings?

**Method**

- Auger holes
- Composite samples: 1 – 2 m, 5 – 6.5 m, 15 – 16.5 m, 27 – 28.5 m
- Saturated layer at the base where holes collapsed
Method

- Leach tests at a range of L/S: 20, 10, 5, 2, 0.3
- Leachate analysed for:
  - Na, K, Ca, Mg
  - Cl, SO₄, Alkalinity
  - Si, Fe

Gold tailings

- Quartzite host rock
- Tailings composition:
  - SiO₂
  - ±1% pyrite
  - Minor chlorite, mica, feldspar

Results - summary

Results - salinity

Results - cations

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Findings

- Leachability not linear, not proportional to L/S
- Nature of the sample
- Particle size
- Chemistry of the liquid
- Residence time
- Number of repetitions
- Degree of agitation
- Method of analysis
- Liquid to solid ratio

Summary

- Leachability is not a linear function of L/S
- Cannot scale 20:1 L/S to field conditions to obtain estimate of drainage quality
- Using L/S of 20, such as required by DWAF (1999) could overestimate leachability by 3 to 10 times
- Using L/S of ±1 is consistent with conceptual model developed from field observations
- “Practical” to use L/S in range of 2 to 10
Thank you

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