





Remote Sensing of AMD by Google Earth®

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Oxidation Zone

ср

40µm





Dold et al., 2005 ES&T

Role of LMWCA in Fe-cycling



Bahia de Ite, Peru



AMD Development



Fe²⁺-rich plu

3. Advanced low pH drainage

1. Active

environment to Fe³⁺ are hydrolysis = > AMD F

AMD plume

Dold (2014)

Cerro de Pasco, Peru

Excelsior Cerro de Pasco, Peru

Ocroyoc

Quiulacocha

Yanamate



Image © 2005 DigitalGlobe



Yanamate AMD reception lagoon 2003

Wisskirchen et al. 2010



Yanamate AMD reception lagoon 2019

Cretton 2011

Cerro de Pasco, Peru



Pb-Zn-sulfide tailings Carbonate-rich Cu-sulfide tailings As-rich



Excelsior waste rock dump ~60 wt% pyrite

FeS₂ + $7/2O_2$ + H₂O --> Fe²⁺ + 2SO₄²⁻ + 2H^{*} Fe²⁺ + $1/4O_2$ + H^{*} <-> Fe³⁺ + $1/2H_2O$

FeS2 + 14 Fe³⁺ + 8H2O --> 15 Fe²⁺ + 2SO4²⁻ + 16H⁺ Fe-Zn-Pb-plume

Cemented zone

the month of The out

Active tailings

FeS2 + 14 Fe³⁺ + 8H2O --> 15 Fe²⁺ + 2SO4²⁺ + 16H⁺

cocha tailings impoundı ~50 wt% pyrite Ocroyoc active tailings impoundment

DARES LOOKING

Cerro de Paseo AMD

AMD

AMD

MD

pH = 2.3; 1691 mg/L Fe, 44 g/L SO4; 6.5 mg/l As; 578 mg/L Zn; 27 mg/L Cu; 0.63 mg/L Pb.

As, Fe²⁺

AMD

Cu.

n Fe³

AMD Production

Pb

Distribution

Element Mobility

2 km

Desplazamiento cm/año

> + 9.0 + 8.0 + 7.0 + 6.0

pH = 1; 4330 mg/L Fe, 29 g/L SO4; 48 mg/l As; 293 mg/L Zn; 87 mg/L Cu; 2.9 mg/L Pb.



Chañaral, Chile



Image © 2006 DigitalGlobe hañ aral © 2006 Europa Technologies

Pointer 26° 18'46.90"S 70° 39'14.26"W elev 23 ft

Streaming ||||

Eye alt 19775 ft

100%

Chañaral, Atacama, Ch

"Google"

October 2003

Eriochalcite CuCl₂•H₂O

Metal Flows at Chañaral, Chile









Mirada satelital a la catástrofe en el norte



Una imagen reciente de Chailiaral captada por el satélite FASat Charlie que opera la Fuerza Aérea de Chile permite dimensionar el impacto de la crecida del río El Salado, al compararla con una toma del año pasado.





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Thank you!

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