BAUXITE RESIDUE VALORISATION AND BEST PRACTICES CONFERENCE

Leuven 5-7 October 2015

Université Lille1
Sciences et Technologies

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RE-USE OPTIONS OF VENEZUELAN BAUXITE RESIDUE: POTENTIAL APPLICATION IN ACID MINE DRAINAGE REMEDIATION

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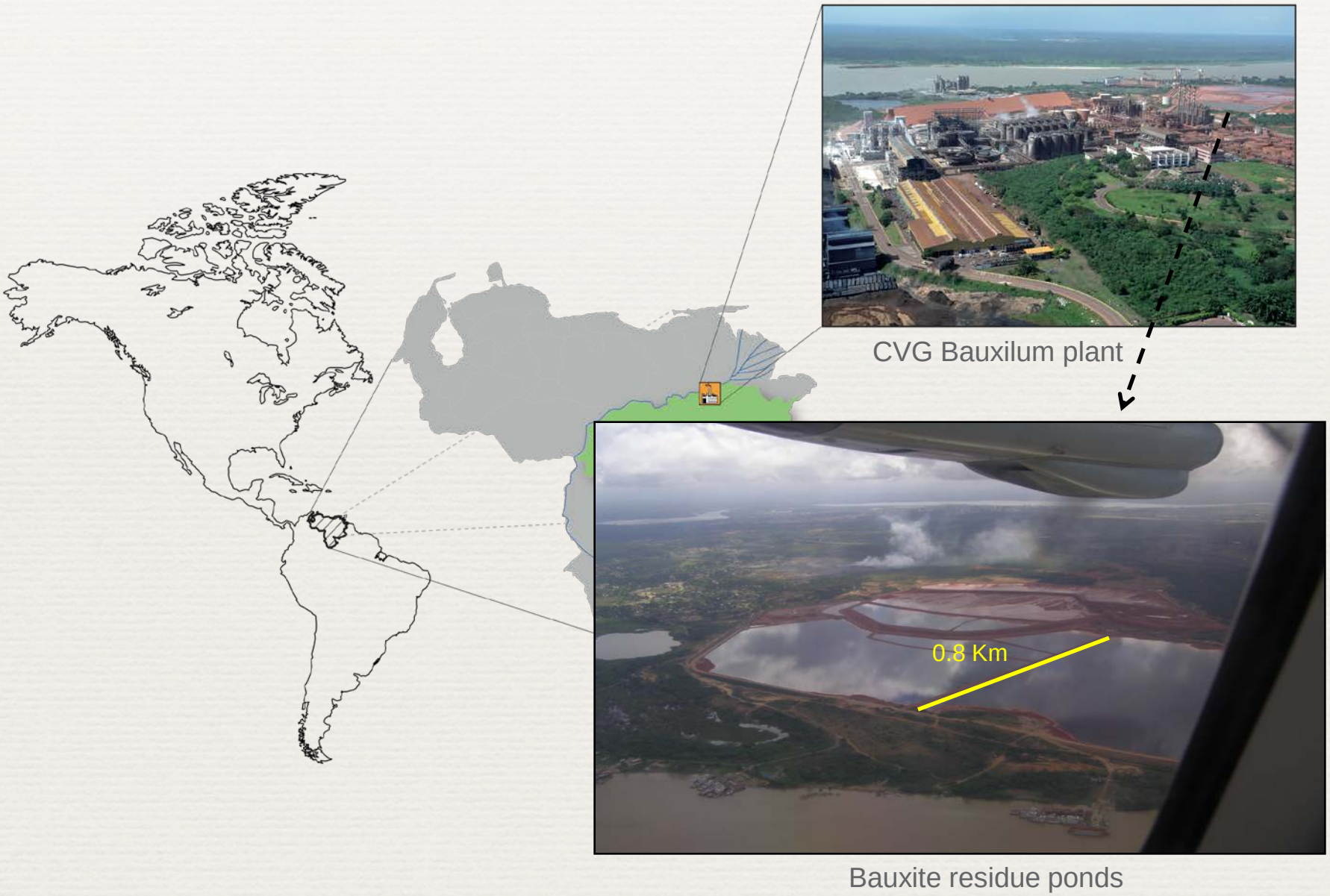
Leuven, BR 2015

The Venezuela Alumina



CVG Bauxilum plant

Bauxite residue ponds

Objective

Study of the sorption properties of acid neutralised bauxite residue (solid residue) under acid conditions similar to those of acid mine drainage

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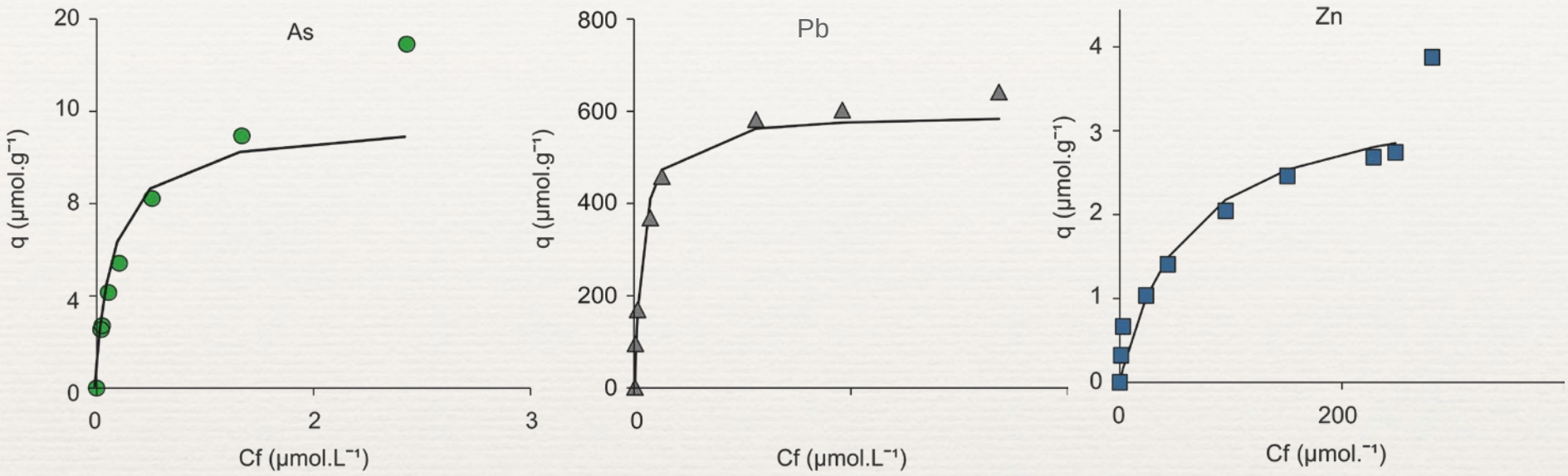
- Adsorption capacity => Batch tests

Zn^{2+}, Pb^{2+}, As (V) arsenate

- Chemical speciation => Sequential chemical extractions

Adsorption capacity of BR



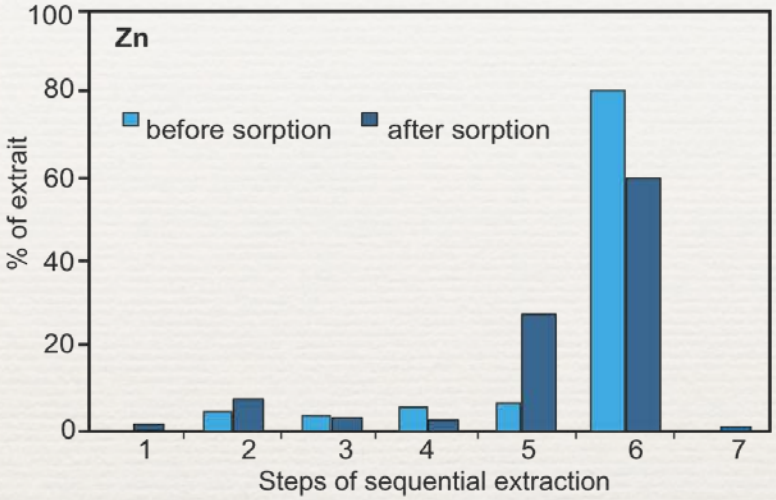
Langmuir adsorption plots for arsenate, lead and zinc. Reaction conditions: bauxite residue dosage 50g.L-1, Ionic strength= KNO3 0.01M, pH 4.5±0.1 and temperature of 22 ± 1°C

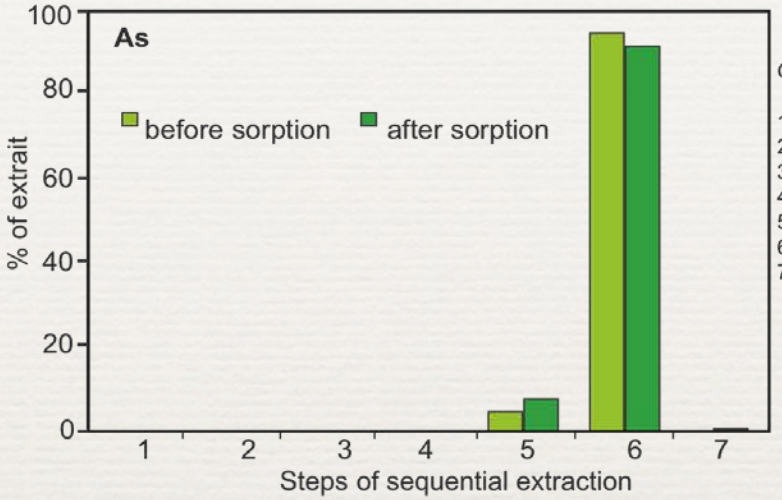
- Pb and As(V) distributions follows the Langmuir model

- BR could adsorb more arsenate => at the highest As (V) initial concentration the percentage of adsorption by the residue was at 99 %

- Two different mechanisms operate for Zn sorption: Surface mechanism (adsorption) and co-precipitation (formation of a Zn-Al hydroxide)

Chemical speciation





Geochemical phases:

1) water soluble
2) really exchangeable
3) bound to carbonates
4) bound to manganese oxides
5) bound to amorphous iron oxides
6) bound to crystallised iron oxides
7) bound to organic matter

Associated with Fe and Al hydroxides <=> Adsorption sites

Amorphes Al-Fe-hydroxides = Higher specific surface area / porosity

Conclusions

- The adsorption is the main retention mechanism of As(V), Pb and Zn by the BR. The co-precipitation should not be neglected, especially for Zn

- The Venezuelan bauxite residue could be a useful retention agent for the treatment of acid mine drainage polluted by Pb, Zn and As(V)

Thank you for your attention