HYdrometallurgy and Phytomanagement Approaches for Steel Slag management (HYPASS)

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ABSTRACT

The steel slags produced and the available stocks are considerable. Managing these co-products requires finding a solution for their future that is satisfactory from both an environmental and economic point of view. The research aims to propose an integrated, sustainable and economically rational solution to this problem.

It includes the development of physical and hydrometallurgical processes for the basic recovery of metals and metal oxides and the evaluation of phytostabilisation methodologies, already tested on steel slags, for secondary residues resulting from these treatments. The integrated solution concept will also be based on the control of environmental impacts and/or the study of sustainable eco-compatibility.

In addition, HYPASS plans to list and map former slag heaps, carry out "Life-Cycle Analyses" (LCA) for the various recovery methods and build a "Decision-Support Tool" (DST) to facilitate the identification of the best treatment methods, both from an economic and environmental point of view.

Keywords: hydrometallurgy, phytomanagement, unit processes, steel slags, processing, reuse, sustainable development, "Life-Cycle Assessment" (LCA), "Decision-Support Tool" (DST).

GENERAL STAKE, SCIENTIFIC LOCKS

The general challenge is to recover waste without increasing its toxicity ["Life Cycle Assessment" (LCA) aspect].

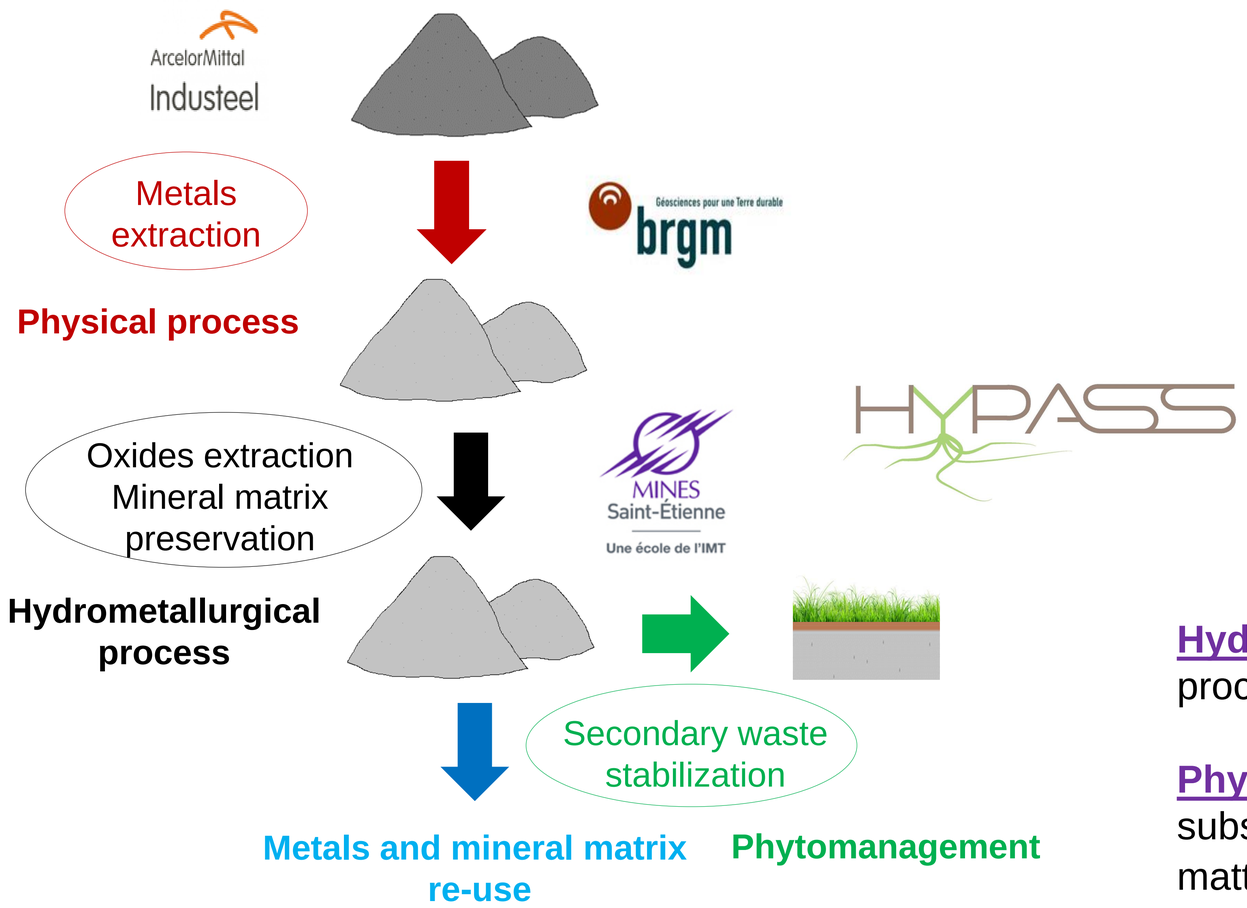

Figure 1: the HYPASS methodology.

Hydrometallurgical locks: development of a basic leaching process, prediction of the properties of precipitated solids.

Phytomanagement locks: vegetalization of a potentially phytotoxic substrate (very basic, draining, poor in nutrients and lacking organic matter).

EXPECTED IMPACTS

Technical impacts: previous tests carried out at BRGM showed that sequential grinding followed by multipolar magnetic separation is a promising approach to recover high percentage of metals from numerous mineral matrices. Indeed, as compared to currently applied practices, this recent technology allow to achieve an optimal degree of liberation for targeted critical metals. Developing and adjusting this approach for slag processing, in combination with hydrometallurgy, is very innovative and promising as this could make more effective the treatment of large amounts of slags that are currently weakly re-used.

Industrial impacts: landfilling has long been and is still used to dispose off large volumes of slags. However, increasing legal and environmental constraints progressively lead to limiting this practice. This gives "entrepreneurs" a margin for processing slags to recover valuable contents, while decreasing the total volume for disposal and turning waste into a re-usable material, thus saving landfill costs.

Economic impacts: the development of a more efficient of a more efficient, strategically sound, and environmentally friendly system for processing steel slags will give steelmaking industry a technology that they can potentially in the future market, build and operate, which in turn would create jobs in Europe to process the large number of slagheaps throughout the European Union.

Policy impacts: the present project could help to reach the ambitious French and European recycling targets set in the Directives 2008/98/EC on waste ("Waste Framework Directive") and 1999/31/EC on the landfill of waste. They are still low in ascending European countries where the largest gains are possible.

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