SUSTAINABILITY OF BATTERY SEGMENT AND RECYCLING OF STRATEGIC METALS

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Energy issues and climate changes are now asking urgent solution and one of the solutions is large growing of renewable energy part in the consumption models. However, major part of renewable energy equipment's contains strategic metals while they could be potential sources of negative environment impact when recycled with non-appropriate processes. Within this problematic we will present 2 segments related to Lithium ion and Ni-MH batteries.

Since its introduction 15 years before, lithium ion battery (LIB) become today the most largely adopted for portable electronic devices. Recently the new chemistry of both cathodes and anodes allow the LIB system to be among the best system candidate for in EV and HEV segment. However the composition of those batteries imposes a particular consideration of their end of life management due to the environment impact and valuable resource conservation for materials. Several processes were proposed for recycling LIB while in the meantime composition of li-ion batteries is strongly moving from lithium cobalt oxides / carbon portable segment to several kinds of cathodes materials, electrolytes and anodes materials. This means that we are in the need of new flexible processes. The sustainable way to recycle LIB must take account on next challenges:

- Lowest energy consumption
- CO2 emission (from organic solvents and carbon)
- Fluorine control (from anion of lithium salts and PVDF).
- Loss of valuable resources such as graphite lost as CO2, Mn and Li trapped into slag.

Nickel metal hydride batteries are also now more and more substituting the Ni-Cad system. Until now at industrial level the main efforts were devoted to recycling Nickel and the rare earths (RE) were generally lost in slag if metallurgical way is used.
The position of RE in critical metals classification imposes to consider the Ni-MH as high source of RE.

Geopolitical aspect will be presented for the main strategic metals of LIB and Ni-MH batteries

To achieve high recycling rate and low environment impact new processes obtained during involvement in several clusters and Networks[1] will be presented. Remaining challenges for recovery other valuable materials from advanced batteries will be discussed.

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[1] *1-National French Network Project (IRISBUS, FIAT, CEA, IFP, MICHELIN, RATP, EDF)*
2- 7th FP European Cluster (Renault, Volvo, Solvay, Continental, University of Munster, University of Grenoble, University of Kiev, Cegasa Batteries, lithium balance)