



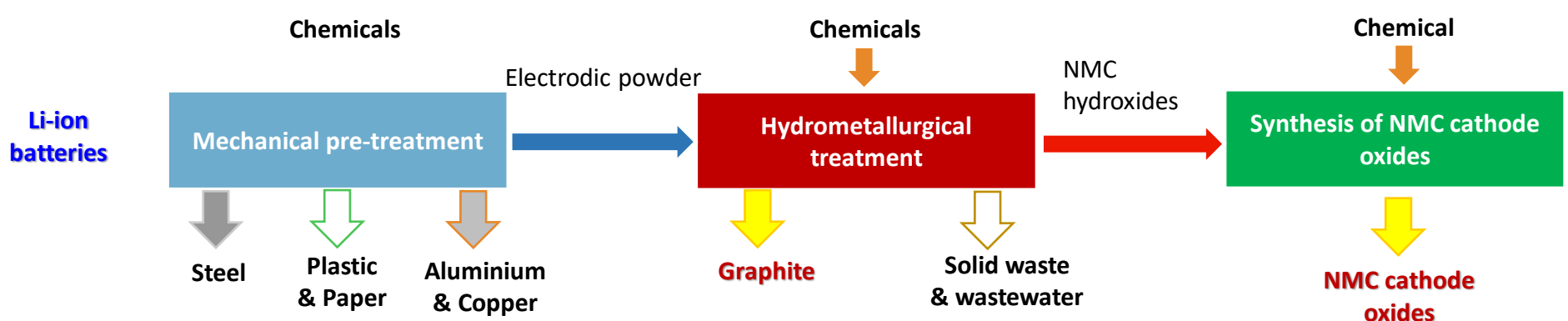
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1. Block diagram of the process

The following figure shows a simplified block flow diagram of the process for the innovative recycling process for lithium-ion battery, which permits to recover graphite and directly synthesize a high-quality cathodic material for new NMC batteries:



The three main sections of the process are:

- Mechanical pre-treatment;
- Hydrometallurgical treatment;
- Synthesis of NMC cathode oxides.

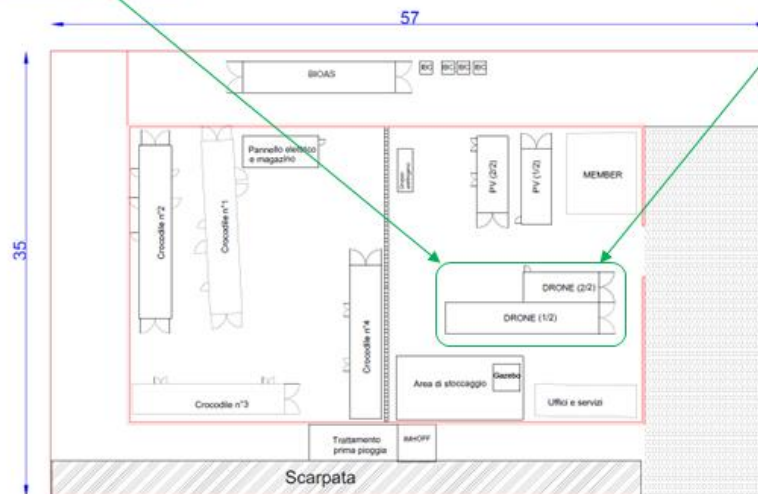
In the first section the batteries are sent to dedicated mechanical pre-treatment that allows to separate 4 distinct fractions: steel, plastic/paper, copper/aluminum, electrode powder. The electrode powder is treated in the second section of the process, where it undergoes a washing treatment to remove the electrolyte present in the fraction, a leaching treatment, followed by a purification and a precipitation treatment, which result in the separation of purified graphite and mixed NMC hydroxides. In the third section of the process the hydroxides are dried, grinded with added lithium carbonate and fed to the furnace, resulting in the production of NMC cathode oxides.



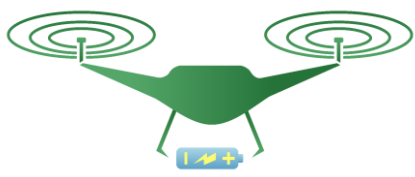
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2. Construction of the pilot plant

Demonstration activities at ECOREC industrial site include the production of NMC oxides starting from electrodic powder produced as an output of the mechanical pre-treatment section.



Hydrometallurgical-synthesis section plant has a potentiality of about 30 kg of electrodic powder per batch. All the equipment is getting placed inside a 12 m container (hydrometallurgic section) and a 6 m container (synthesis section).



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The following new prototype units are currently in place inside the containers while the remaining ones will be integrated soon :

- Precipitation reactor



- Filtration systems





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- New filterpress cloth



- Ball mill





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- Dryer

