

**Lithium carbonate from industrial waste waters:
An up-scaling project**

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Extracthive is a French SME specialized in the recycling of industrial waste.

We operate on 3 locations with 40 employees. In 2018 we generated a revenue of 3,4 M€

Our three entitees

Extracthive Process Designers

Our R&D Team

Extracthive Ceramics Recycling

Our comminution facility

Extracthive Chemical Products

Our piloting facility



Ongoing projects

Jaguar

Recycling of zinc containing residue

EWI

Extraction of iron from bauxite residues

Imp@ct

Hydrometallurgical processing of stibnite



Recycled products

Silicon carbide (SiC)

Pig iron foundries

Alumina (Al₂O₃)

Recycling of spent refractories and catalysts

Application in the production of refractories and abrasives

Zirconia (ZrO₂)

Agglomération of EAF dust

Application in abrasives



Ongoing up-scaling projects

PHOxy

Recycling of resin bonded abrasives

PHyre

Recycling of Carbon Fibres reinforced Plastics

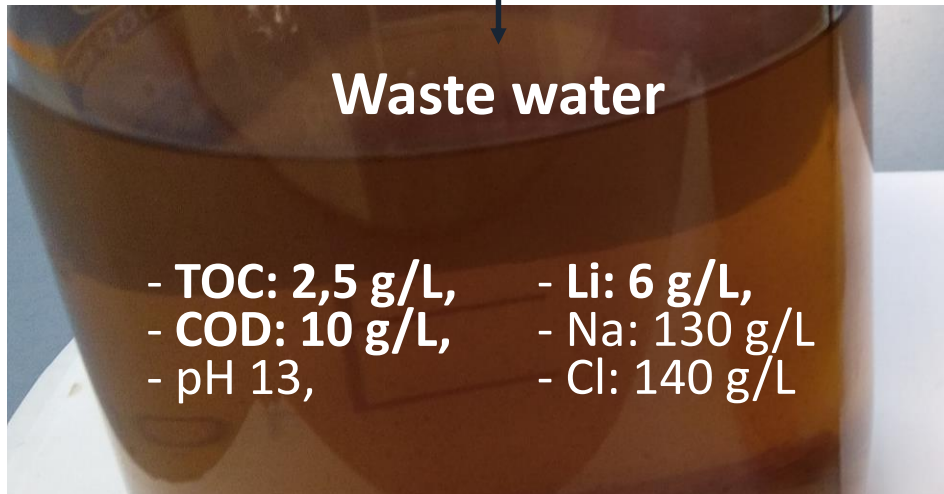
LiCO

Extraction of lithium from industrial waste waters





Some chemical processes employ **BuLi** as an organic base



Our tasks

1- Lithium recovery

→ as Li_2CO_3 (95% purity)

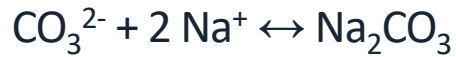
2- Waste water plant compliance

→ Increase biodegradability

3- Scale-up

→ Production of 10 t of Li_2CO_3
i.e. treating about 500 m³ of waste water

Precipitation / filtration of Li_2CO_3



Solubility of Na_2CO_3 \nearrow with température

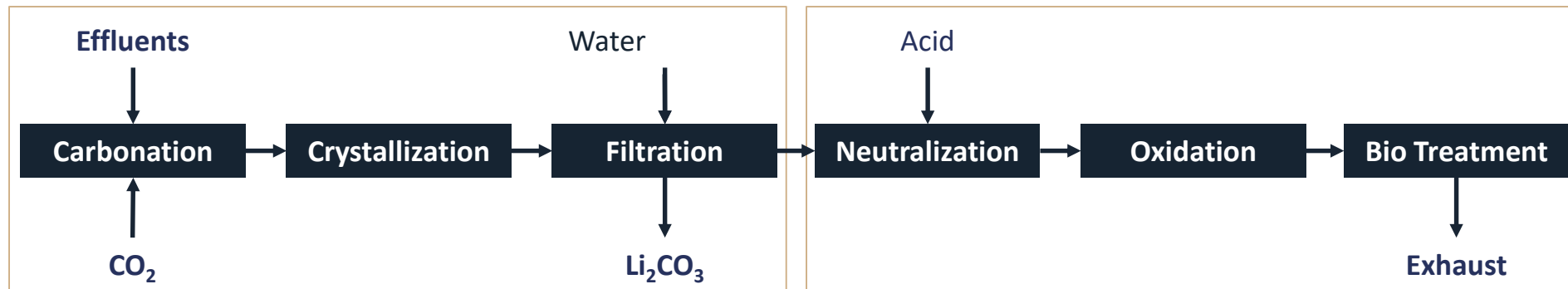
Solubility of Li_2CO_3 \searrow with la température

Neutralisation / oxidation of organics

Neutralisation (HCl)

Advanced oxidation (UV-C, H_2O_2)

Biological treatment



Conditions

Continuous operation

$V_{\text{reactors.}} = 2\text{L}$

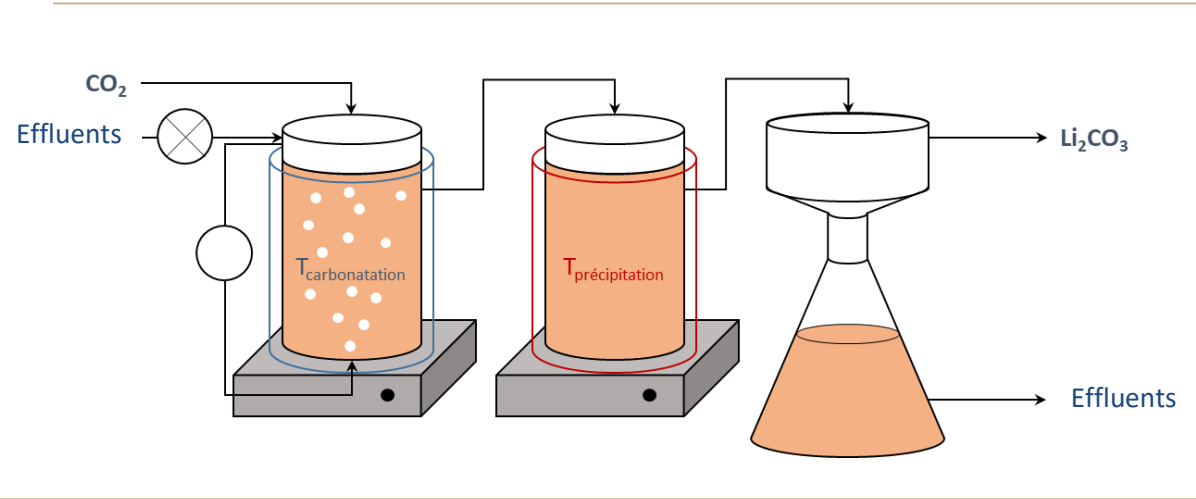
$[\text{Na}^+] = 80 \pm 10 \text{ g/L}$

$[\text{Li}^+] = 6 \text{ g/L}$

$\text{pH} = 12,5$

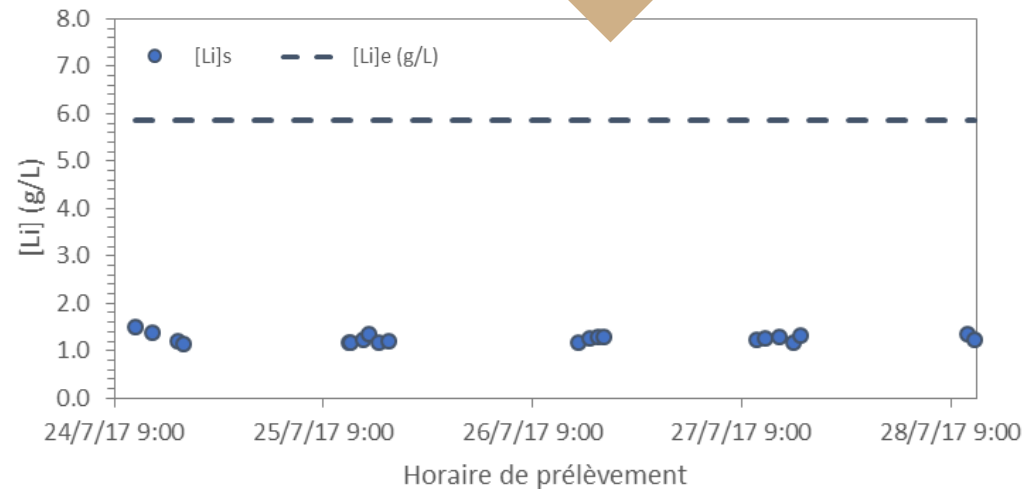
Through put = 1 – 5L/h

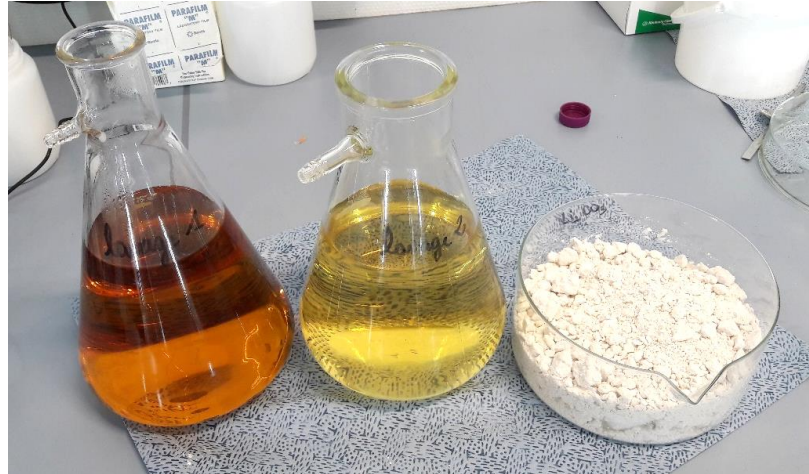
$\text{CO}_2 = 70\text{-}175 \text{ g/h}$



Results

- 80-85% Lithium recovery
- Filtration behaviour OK
- Reproducibility OK
- 2kg of Li_2CO_3 were produced

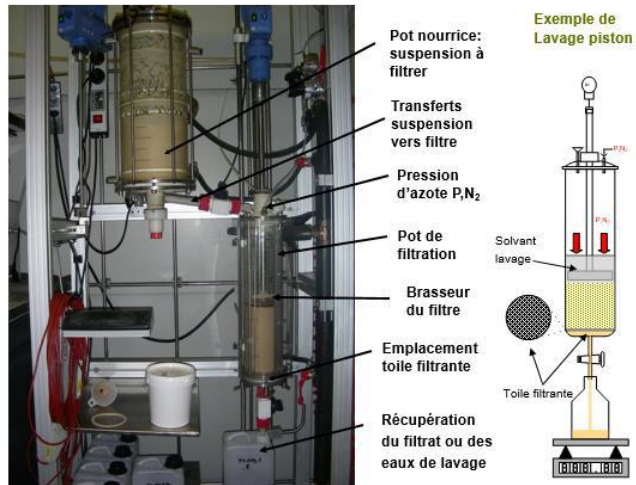




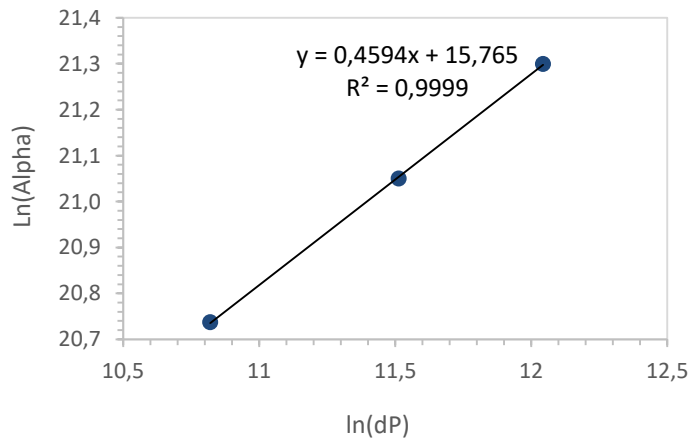
Samples	Na_2CO_3	Li_2CO_3
Test 1	21,0%	72,9%
Test 1 – washed	2,9%	94,5%
Test 2	21,6%	76,3%
Test 2 – washed	2,7%	98,4%
Test 3	20,7%	77,1%
Test 3 – washed	1,8%	96,8%

→ Quality of the precipitate compatible with short loop recycling by the customer

Filtration behaviour



- Poudre < 50 μm
- Carr index : 48 (compressible)
- Angle of repose : 41°
- Compressibility 0,46



→ Filtration is feasible with basically any device
 → Handling of the wet product may be an issue

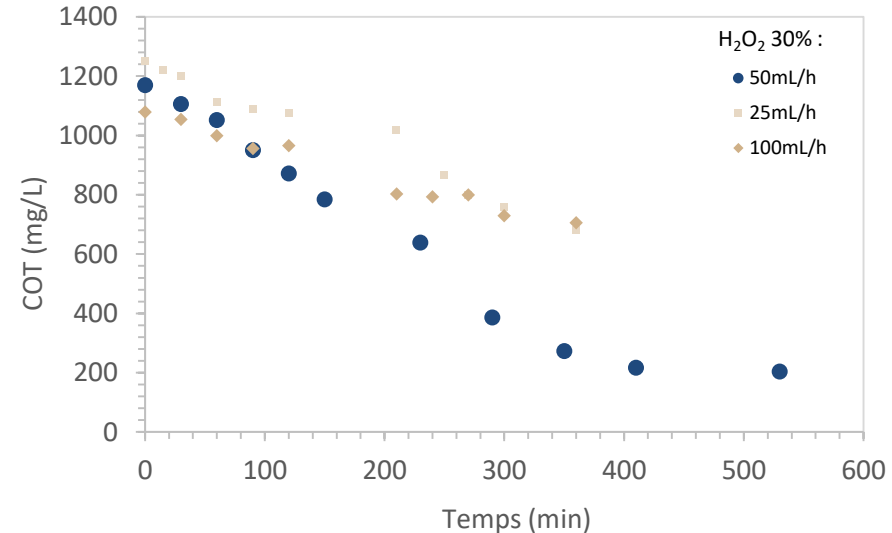
Safety tests

- Flash Point > 110 °C
- Temperature increase under adiabatic compression < 15 °C
- No emission of VOCs during CO₂ stripping



Removal of organics

- Neutralisation with acidic residues (22% HCl ; Ratio < 1:1)
- Photochemical oxidation (UV-C ; H₂O₂)



- This approach isn't economically feasible for complete treatment
- It could be a pre-treatment to increase the efficiency of a biological approach

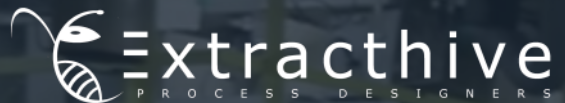
Objectives:

- Production of 10 t of Li_2CO_3 with a purity > 97%,
- Scale 1/5 of the final industrial scale operation
- Hot Commissioning planed for Q1 2020

Operation:

- Duration: 4 month
- Working hours: two shifts a day
- Through put: 2 m³/h
- Precipitation, filtration and washing operated in continuous mode
- Drying in batch mode





EXTRACTHIVE

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Bâtiment 37
30 207 Bagnols sur Cèze

EXTRACTHIVE CERAMICS RECYCLING

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Site de Sorgues
1637 Chemin de la Montagne
84 700 Sorgues

EXTRACTHIVE CHEMICAL PRODUCTS

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Site de Pont de Claix
Rue Lavoisier
38 800 Pont de Claix

