Process simulation of a hydrometallurgical battery recycling

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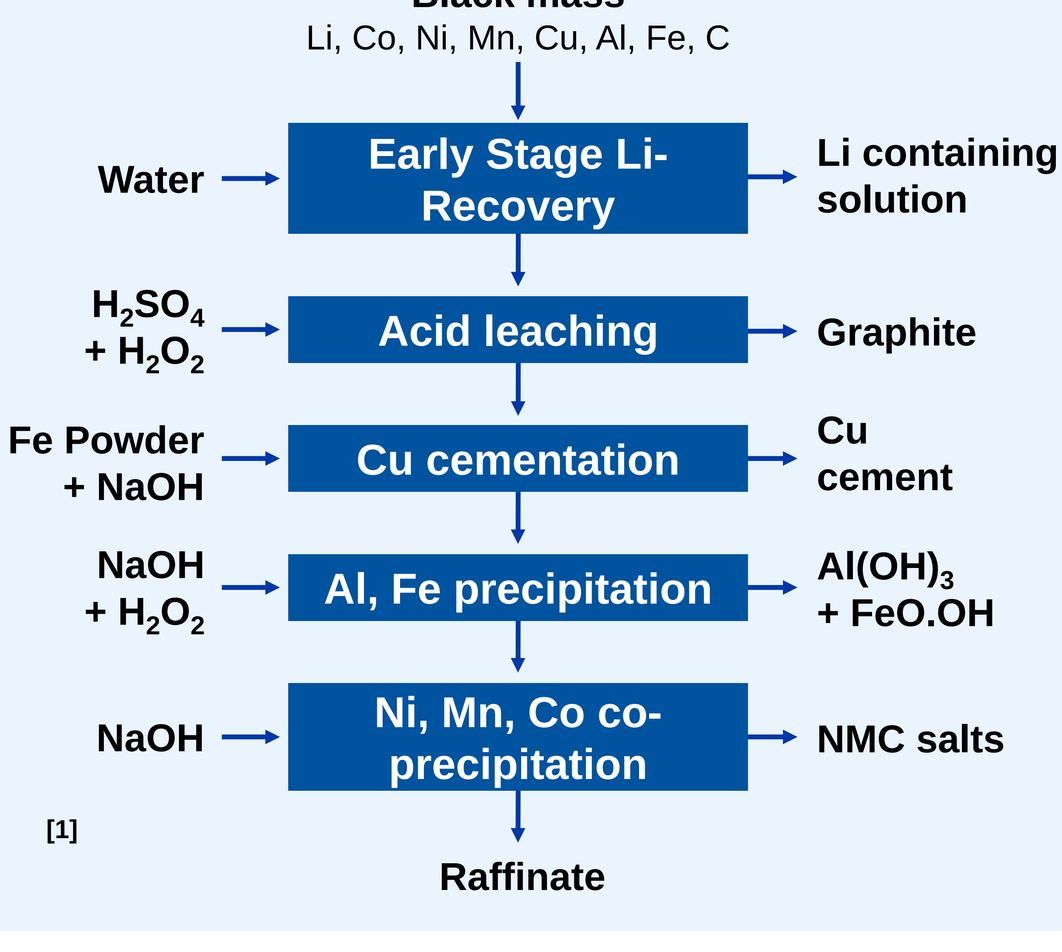
Motivation

- Development of a digital process.
- Increasing flexibilitiy on testing new ideas.

Research Target

- Create a process simulation with aiming near results with experiment data.
- Process design to optimize valuable metal recovery.

Process



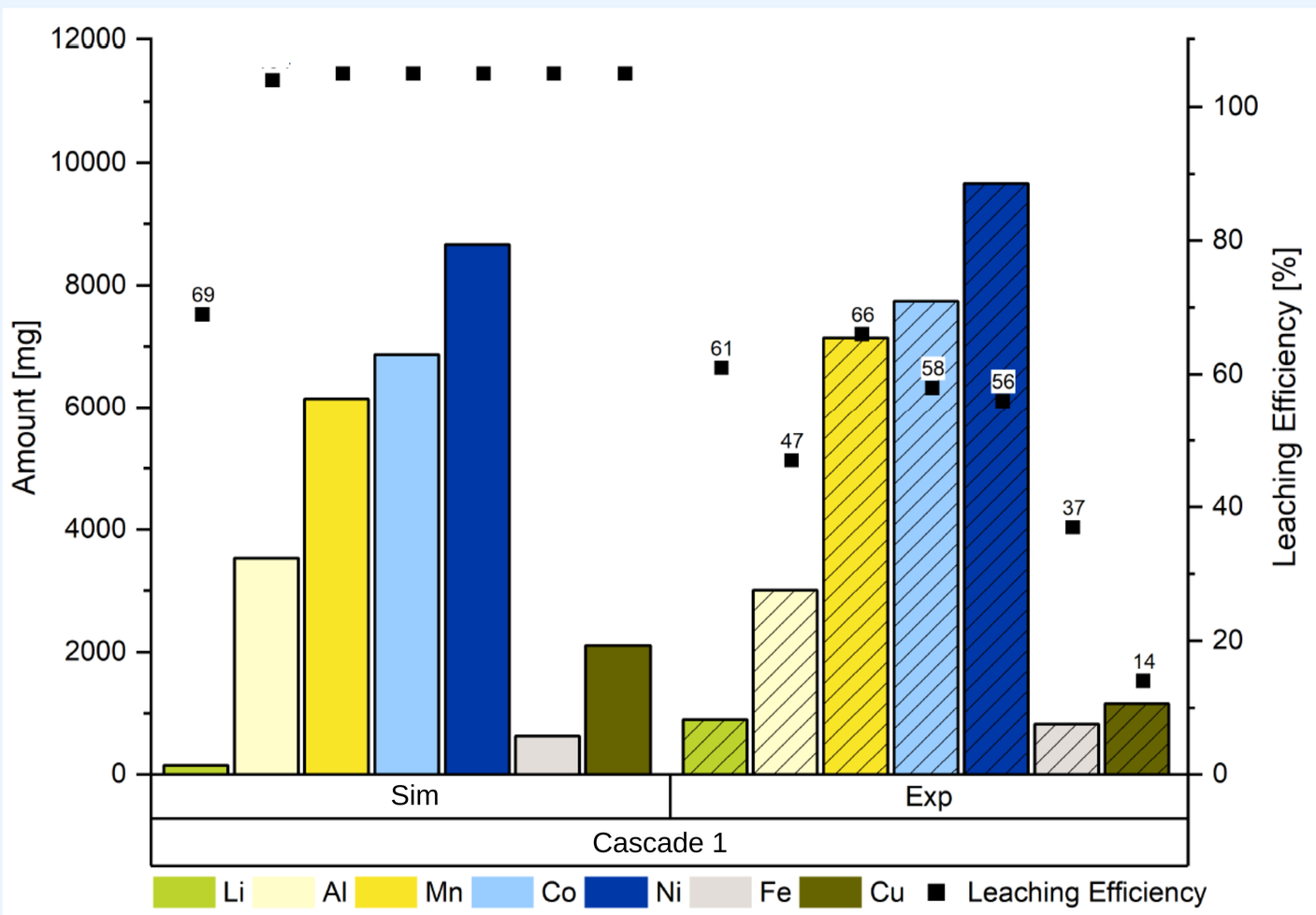
[1]

Method

- Process simulation was created by using HSC Chemistry 10 Sim Module.
- Process parameters can be adjusted by creating controls:

CONTROL TARGET	pH	Enthalpy Balance	H2SO4 Concentration
Process unit	20. Acid Leaching	20. Acid Leaching	20. Acid Leaching
Measurement Unit		kW	mol/L
Set Point	**1**	**0**	**6**
Measured	**1,0004**	**0,000**	**6,09**
Tolerance +/-	0,001	0,01	0,1
CONTROL VARIABLE	**H2SO4**	**Energy in/out**	**H2O in**
Process Unit	20. Acid Leaching	20. Acid Leaching	20. Acid Leaching
Measurement Unit	kg/h	kW	kg/h
Control Variable	**365,5817149**	**148,4653621**	**244,565354**
Min Limit	0	-50000	0
Max Limit	1000	50000	100000

Results



Acid Leaching

- Simulation and experiment results are compared on the plot based on amount of ions and leaching efficiency for cascade 1.
- Dissolution amount of ions is similar.
- Efficiency is different due to application of cascade leaching at experiment.
- 100 % overall leaching efficiency for both after 2 cascades.

Conclusion and Outlook

- The simulation is beneficial for assessing new parameters and processes.
- Experimental work can be improved in order to close the gap.
- Re-circulation of process water to decrease excess amount of waste water, chemical use, and by-products.

Acknowledgements

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References

[1] Honggang Wang. Development of a high efficient hydrometallurgical recycling process for automotive Li-ion batteries. PhD thesis, Von der Fakultät für Georessourcen und Materialtechnik, 24th November 2014.

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