

PULSE process demonstrator trials

Phos4You final conference, Essen, 21 -22 September 2021

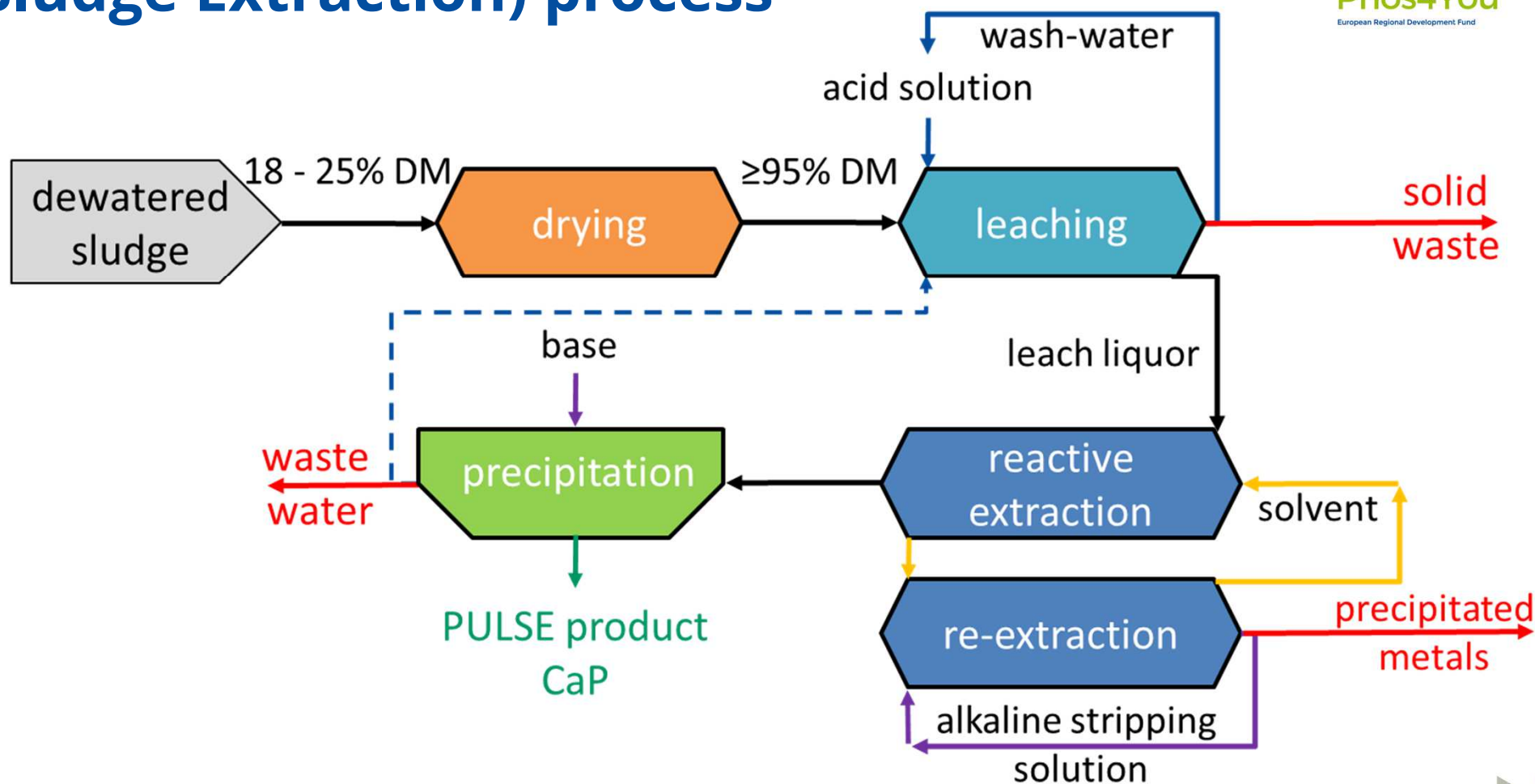
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Content

- PULSE process concept
- PULSE demonstrator
- demonstrator trials
- PULSE product
- conclusions

PULSE (Phosphorus University of Liège Sludge Extraction) process



PULSE mobile demonstrator



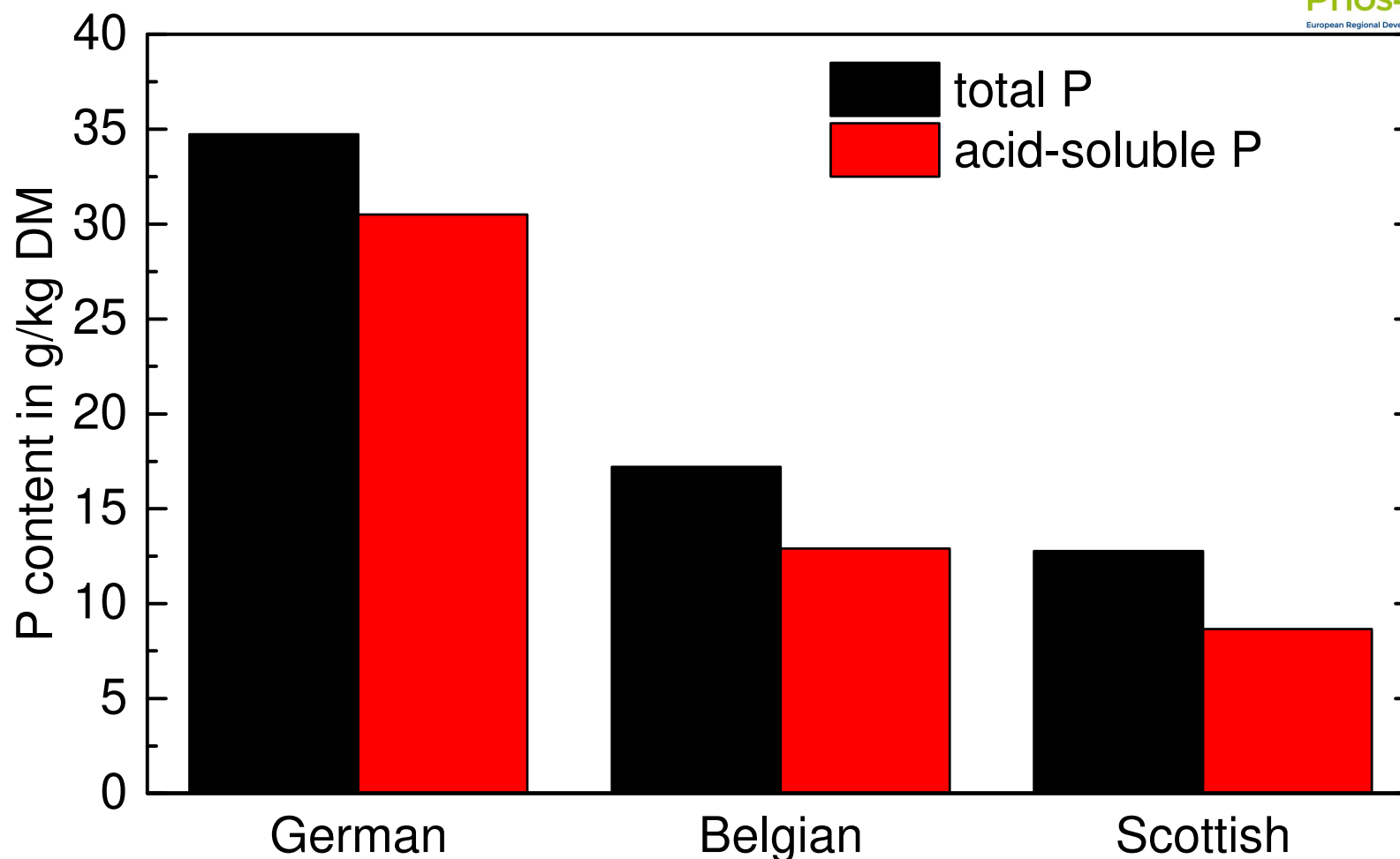
©uliege-michel houet

drying, crushing, leaching
and precipitation modules

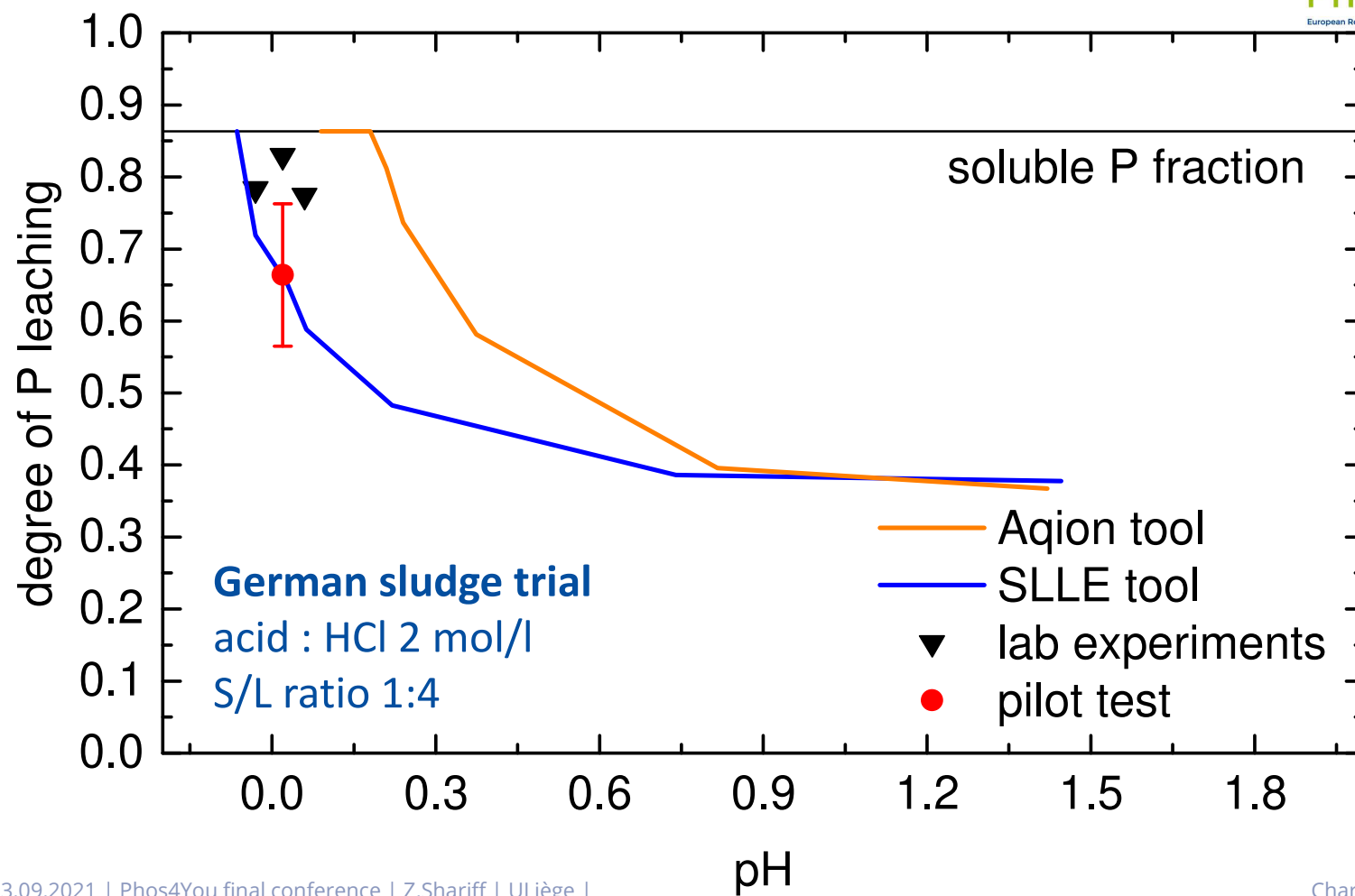


©uliege-michel houet
mixer-settlers for solvent
extraction

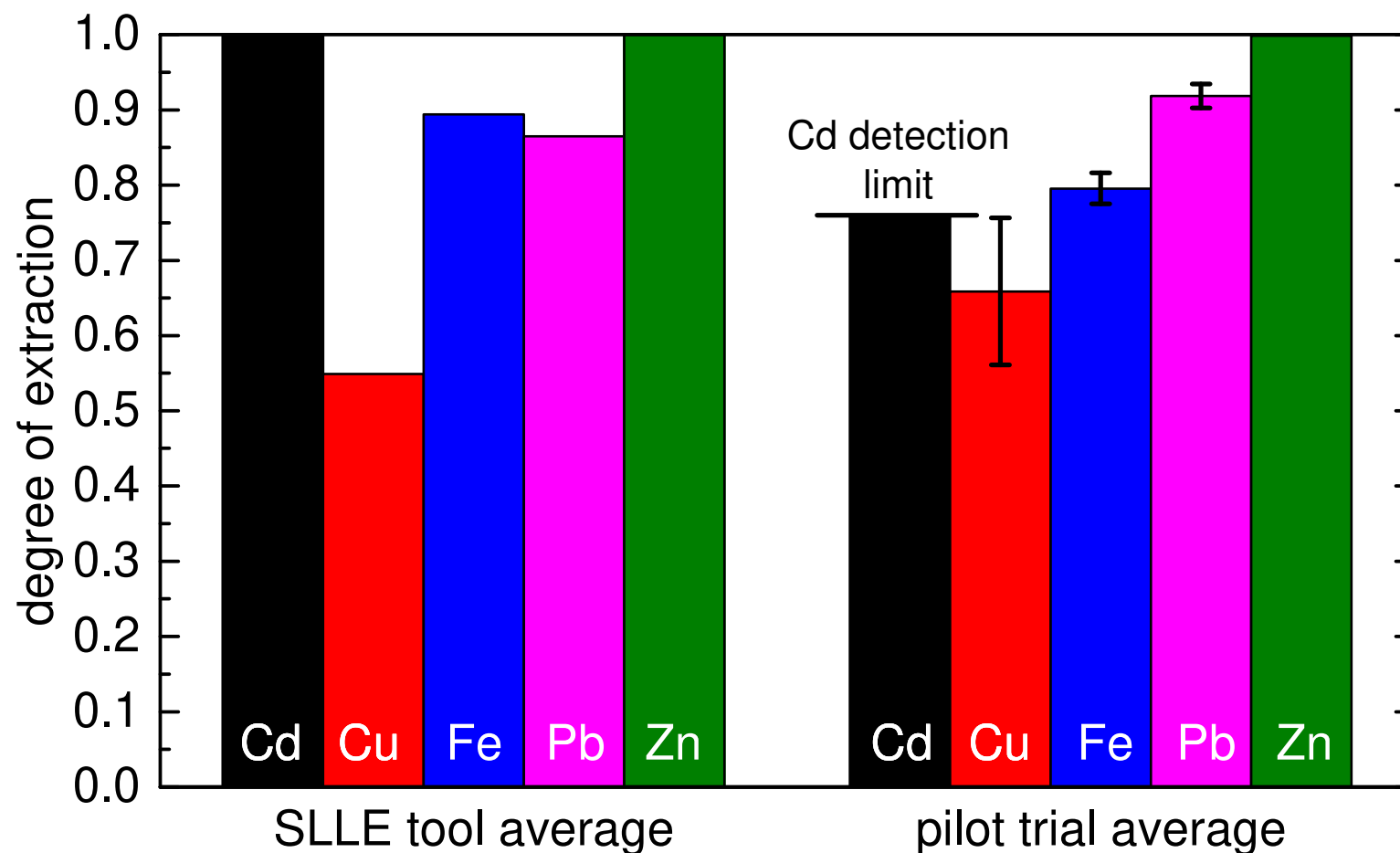
P content in sludge



P dissolution efficiency



solvent extraction of metals



German sludge trial

2 stages

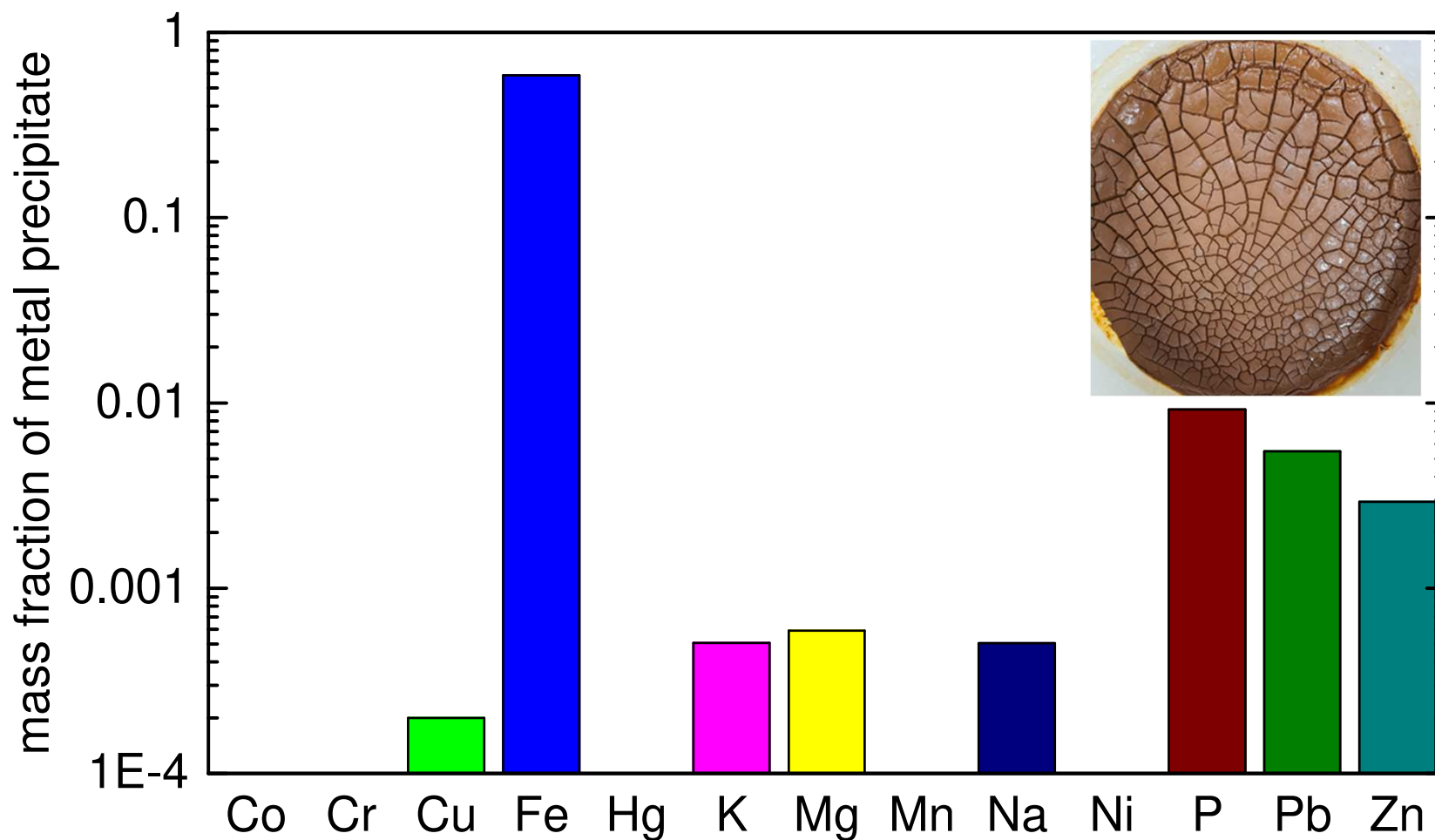
counter-current operation

solvent:

Alamine 336, TBP & Exxal
10 in Ketrul D80

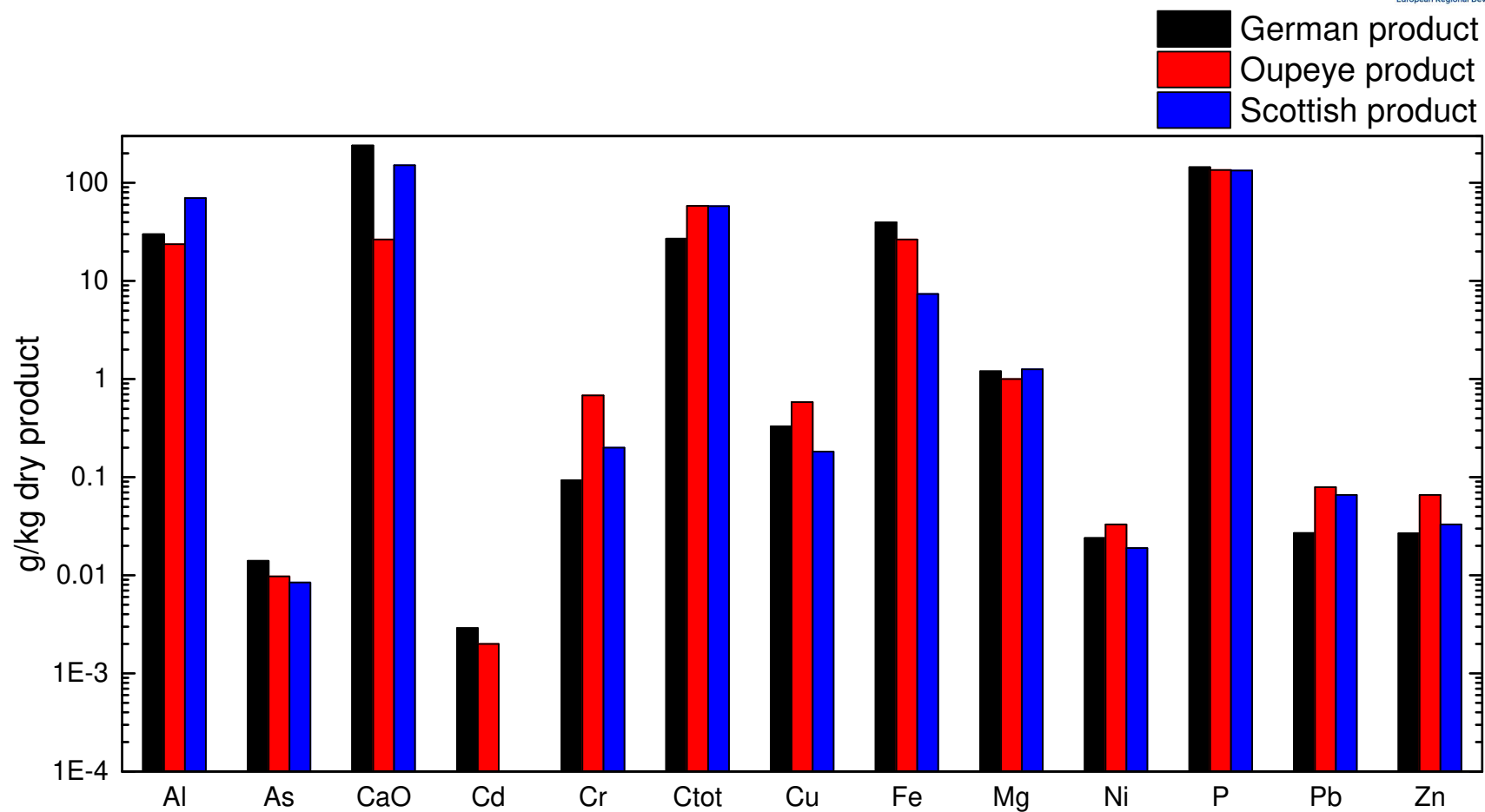
O/A phase ratios tested:
1.5 to 3

metal stripping from solvent



Belgian sludge trial
single stage operation
 NH_3 (3.5mol/l) +
 NH_4HCO_3 (1.5 mol/l)
O/A phase ratio: 4

PULSE product



PULSE product granulation by Prayon



dried filter cake



granulation of ground product

PULSE pilot trial summary

	German sludge	Belgian sludge	Scottish sludge
sludge source wwtp	Dortmund Deusen	Oupeye	Sterling
operation site	at ULiège	at wwtp	Bo'ness testing facility
quantity treated (kg)	~340	~280	~250
P recovery	60 – 65%	60 – 65%	48 – 52%
P₂O₅ %	~33	~31	~29

conclusions

- sludge drying → lower acid consumption, better filtration
- acid-soluble P → recoverable P
- solvent extraction → Fe, Cd, Cu, Hg, Pb and Zn extracted
- product analysis and granulation by Prayon → sufficient P_2O_5 content and good granulation
- equilibrium tool → validation with experimental results, process optimization for different sludges
- optimization potential: bio-gas/ solar drying, ashes as input, bio-leaching

Acknowledgements

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- free samples of chemicals were received from BTC Europe GmbH – samples of Alamine336; TOTAL Belgium - samples of Ketrul D80; Exxon Mobil- samples of Exxal 10
- EGLV; Scottish Water; Oupeye WWTP & SPGE for support with pilot trials
- Prayon → product analysis and granulation and Faculty of Bioscience Engineering - UGhent → sample analysis

Thank you

