
DTU

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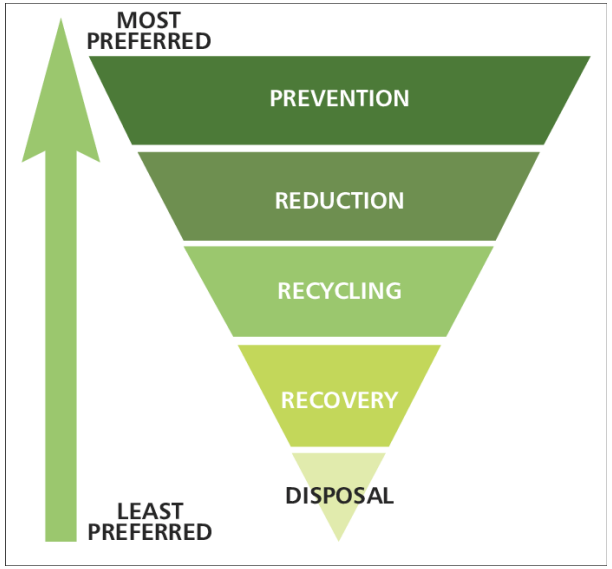
Improving metal extraction from MSWI fly ash through different experimental conditions for the electrodialytic treatment method

www.zerowaste.byg.dtu.dk

Amager Ressourcecenter

Muncipal solid waste incineration (MSWI) in Denmark



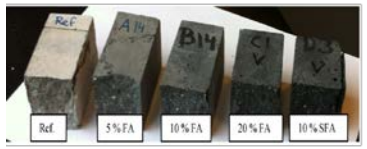
- In Denmark households and industry waste incinerated
- Reduces volume by 90 % and weight by 80 %
- Combined heat and power plant
- MSWI produces about 117.000 tons fly ash and 1.2 mio. tons bottom ash in Denmark

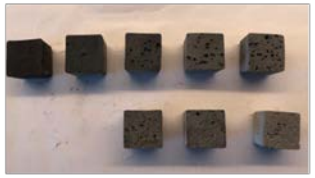
Hazardous fly ash for safe disposal in Norway

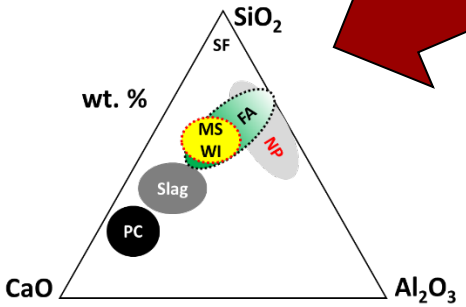
Non-hazardous bottom ash for construction works

Secondary resources

Treated fly ash as secondary resource

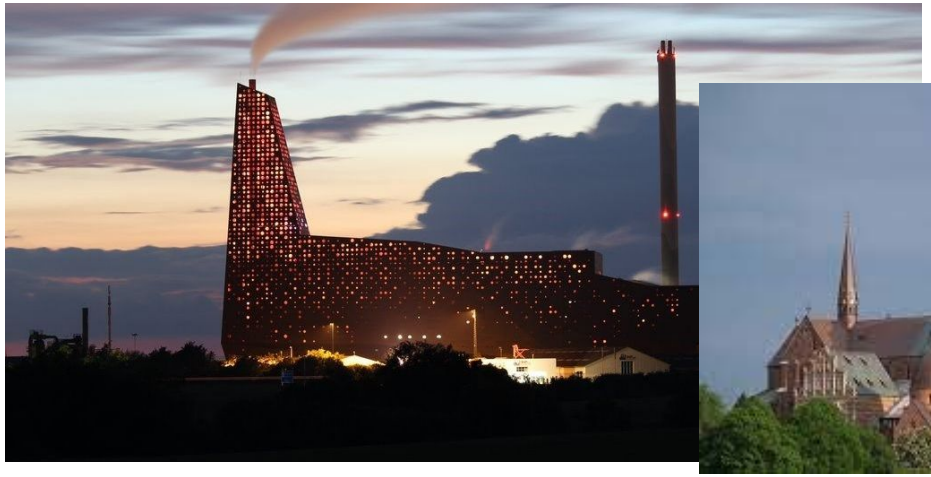






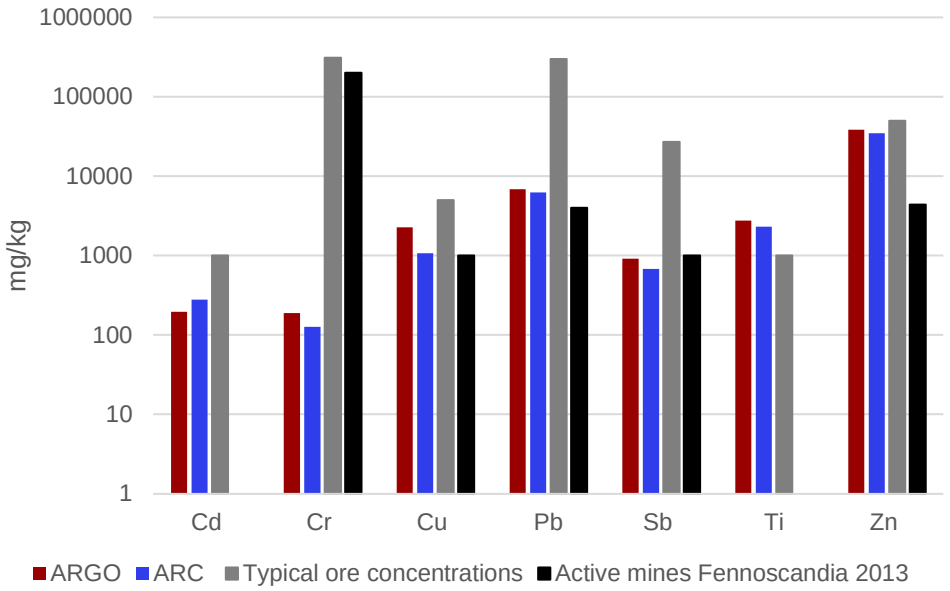
Salts and metals

Experimental samples



ARGO, Roskilde

ARC, Copenhagen



Aim of the study

Electrochimica Acta 181 (2015) 73–81

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journal homepage: www.elsevier.com/locate/electacta

Electrodialytic removal of heavy metals and chloride from municipal solid waste incineration fly ash and air pollution control residue in suspension – test of a new two compartment experimental cell

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Research Paper

Electrodialytic remediation of municipal solid waste incineration fly ash as pre-treatment before geopolymerisation with coal fly ash

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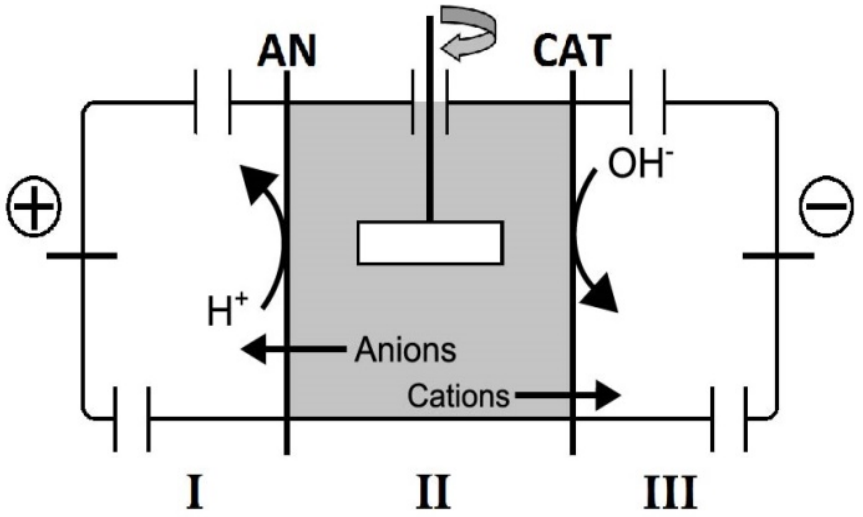
It was investigated if metal extraction rates are influenced by improving experimental conditions, with focus on Cd, Cu, Cr, Pb, Sb, Ti and Zn

The electrodialytic treatment of a fly ash suspension

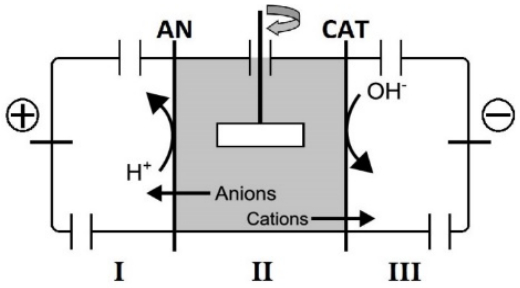


- Acidifiation at the anionexchange membrane (AN) is the basis for acidification of the material suspension

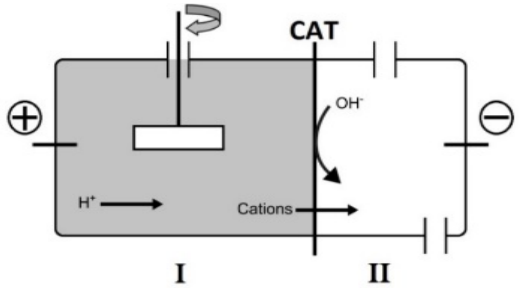
Cathode: $4\ H_2O + 4\ e^- \rightarrow 2\ H_2\ (g) + 4\ OH^-$ (reduction)

Anode: $2\ H_2O \rightarrow O_2\ (g) + 4\ H^+ + 4\ e^-$ (oxidation)

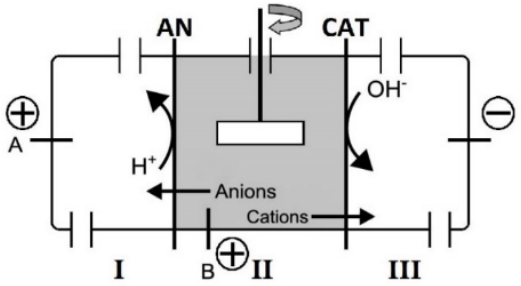
Electrodialytic experiments



Cell A



Cell B



Cell C

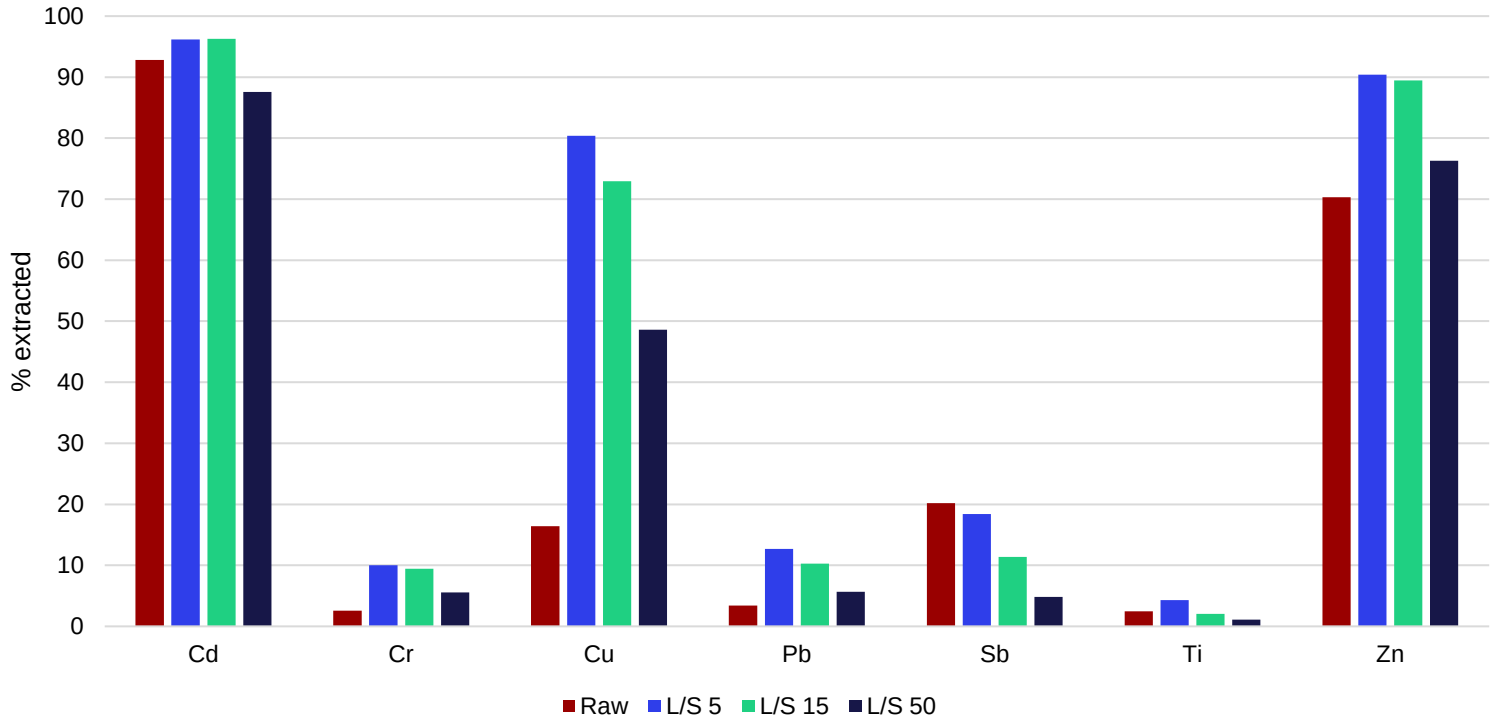
Washing experiments – cell A, prewashed ash L/S 0-5-15-50, ARGO ash

Set-up experiments – cells A-C, prewashed ash L/S 15, ARC ash

Reuse experiments – cell A, prewashed ash L/S 15, ARC ash

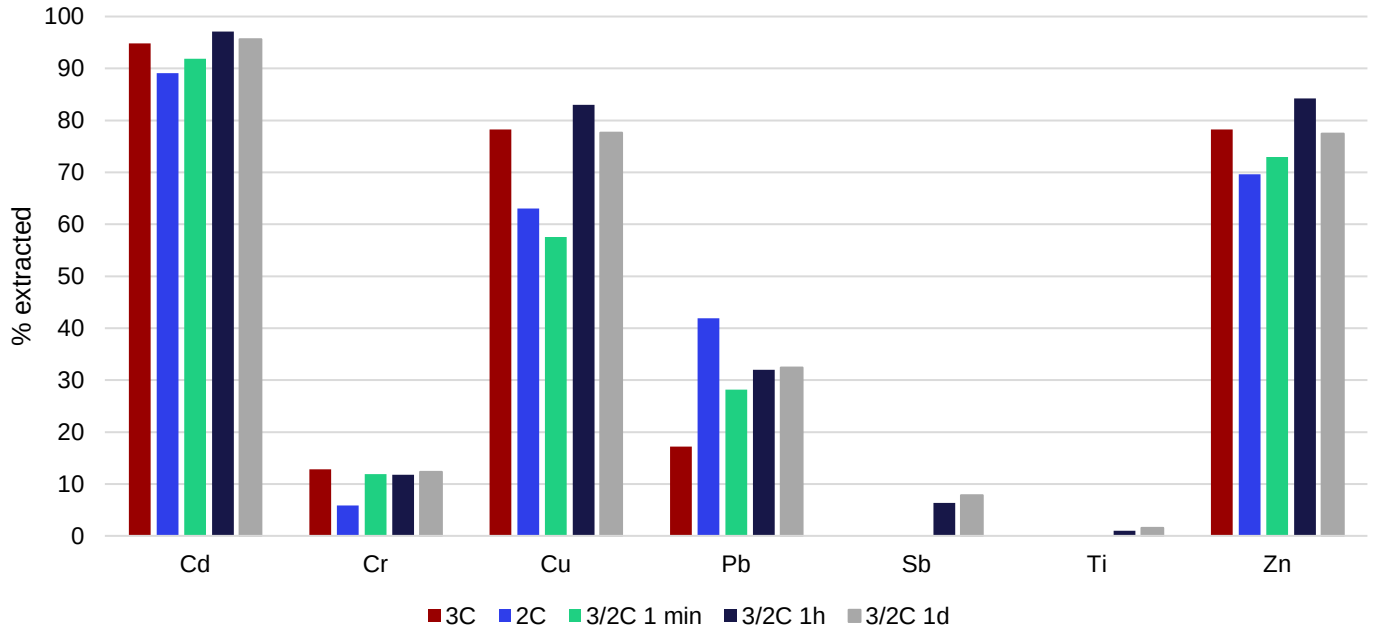
All experiments lasting 28 days, 50 mA direct current

Washing experimental series



- No washing results in unstable experiments due too high salt concentrations and electrical conductivity in the suspension
- Washing at too high L/S resulted in too low electrical conductivity in the fly ash suspension
- Optimium pre-wash L/S 15, which also resulted in 100 % Cl removal

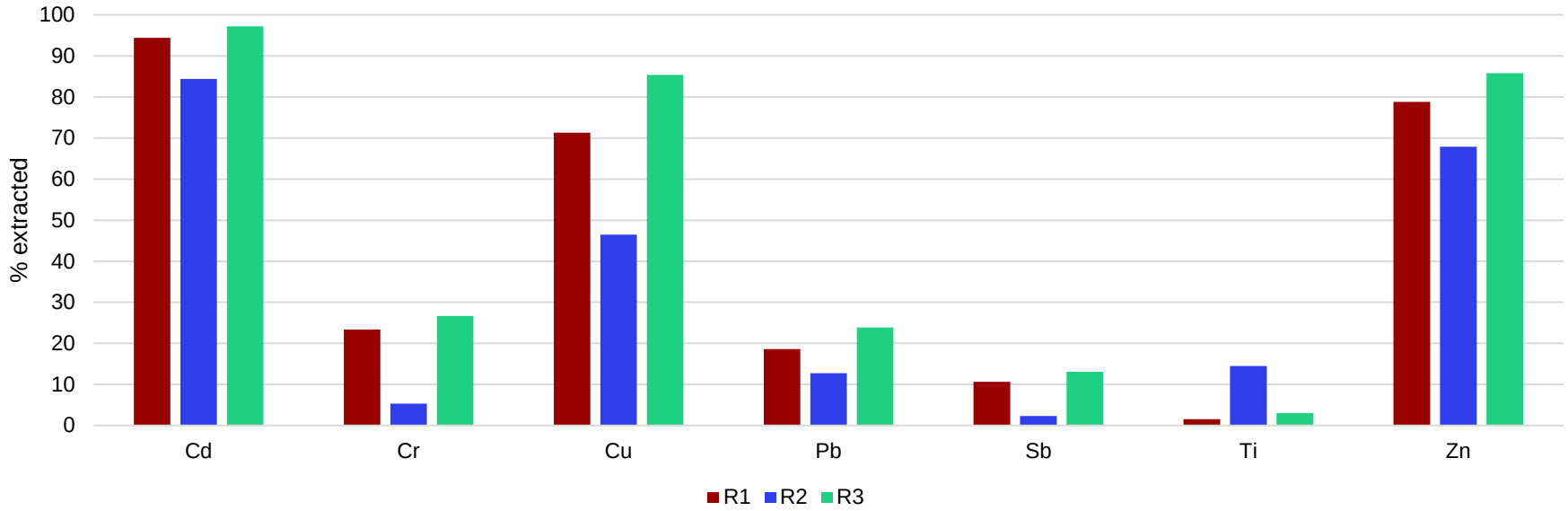
Set-up experimental series



- Highest metal extraction rates in experiments with 3 C and 3/2 C 1 h set-ups
- Pb highest with 2 C set-up

Sb and Ti not measured in the 3C, 2C and 3/2 C 1 min experiments

Reuse experimental series



- Similar metal extraction in the reuse experiments, experimental liquids can be reused efficiently

Comparing extraction

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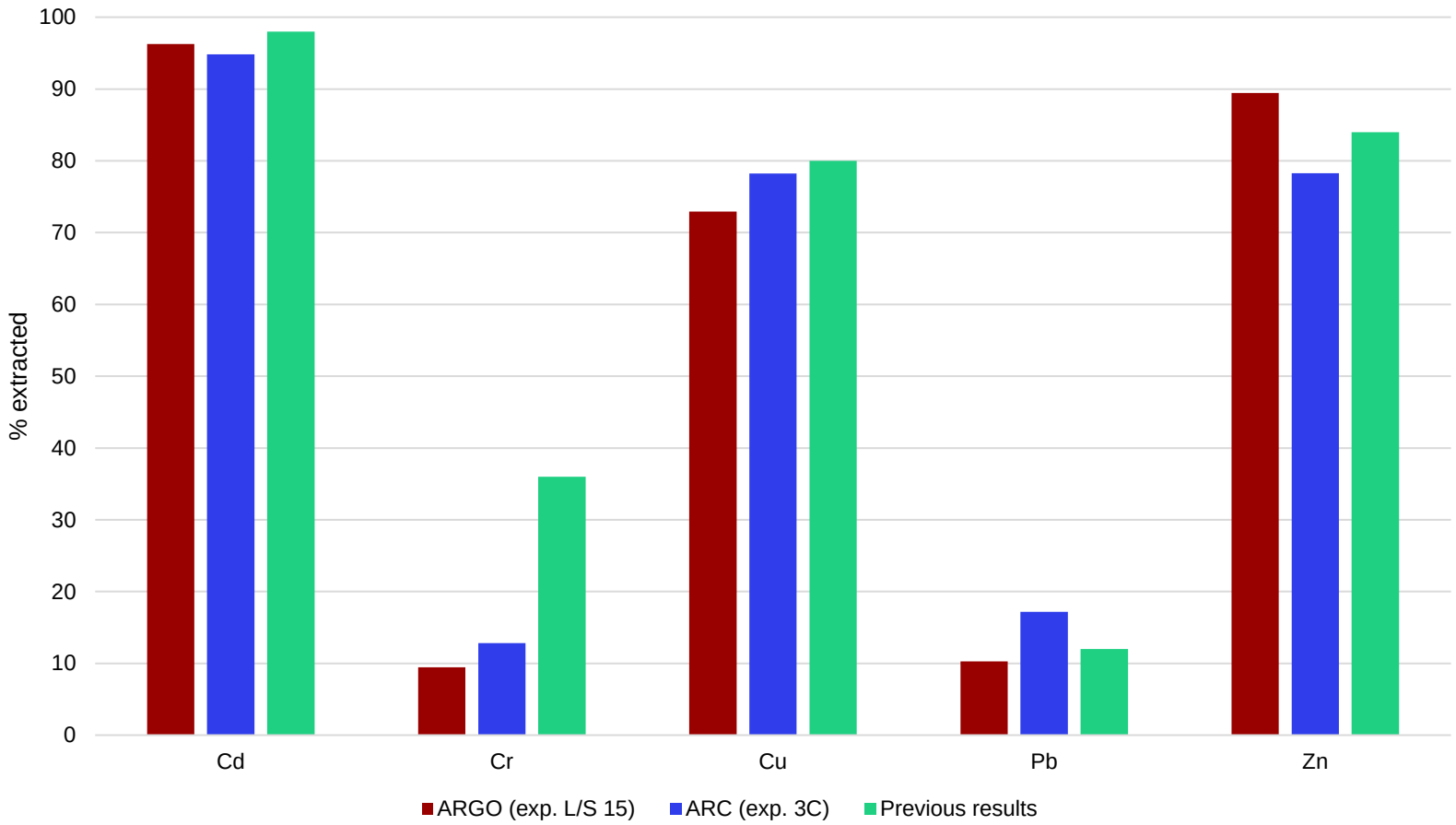

Conclusion

- Pre-washing recommended for stable experiments
- Extraction potentials: Cd, Cu, Zn > Cr, Pb > Sb, Ti
- Robost method regardless of experimental set-ups and fly ash sample