Sustainable and energy efficient leaching of metals with ultrasound controlled cavitation

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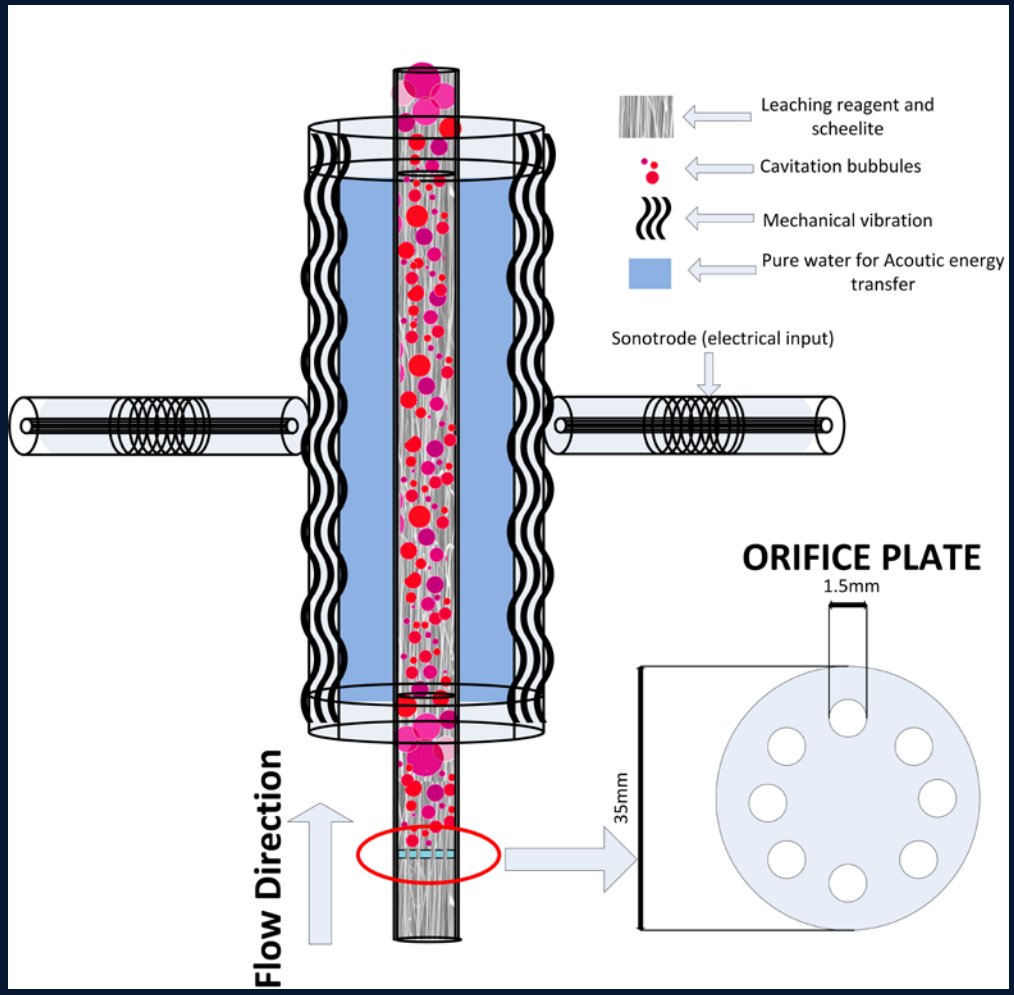
Aim and objectives

- Increase recovery rate and efficiency by ultrasound controlled cavitation
- Focus on minerals and by-products known to be very difficult to leach
- Optimization of a scalable ultrasound controlled cavitation reactor
- Obtain an energy-efficient leaching process at lower temperature and pressure compared to present processes (autoclave)
- Optimization of the reactor's geometric configuration, flow, characteristics, and adaptation of the process parameters in relation to the material to be leached.

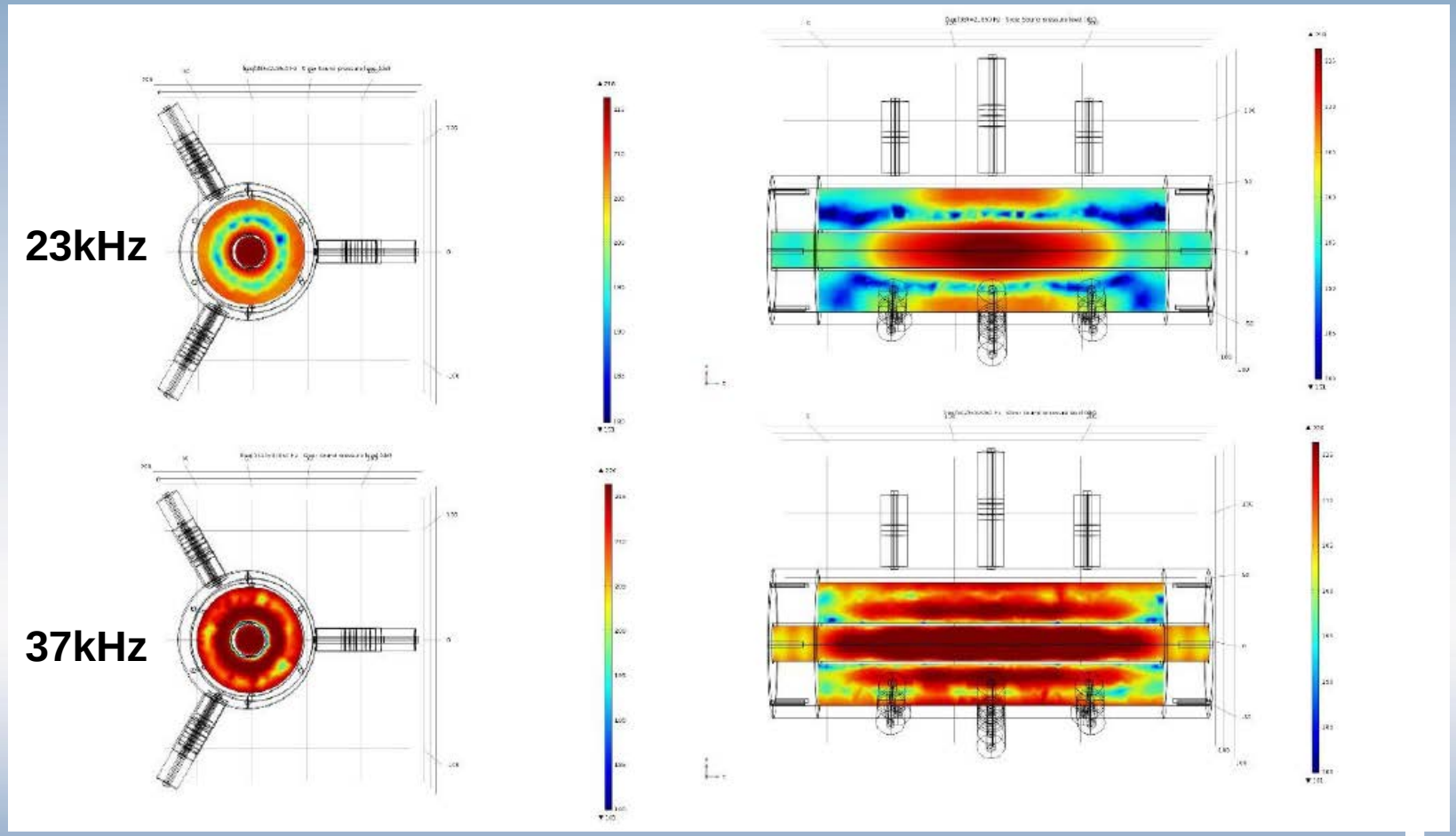
Concept

Hypothesis: *Ultrasound controlled cavitation gives energy efficient process intensification*

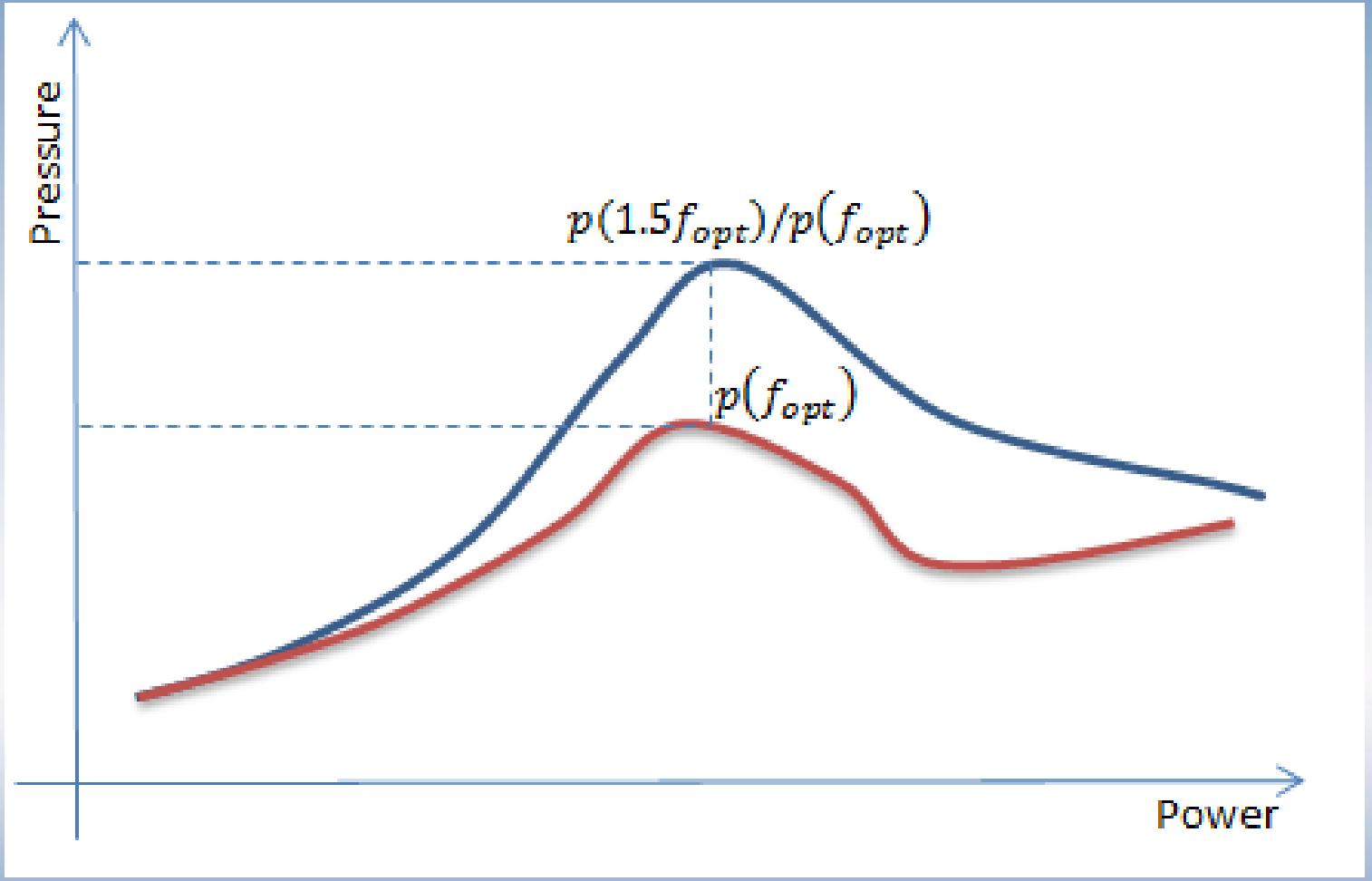
- Flow induced pressure flucuations and initiation of cavitation bubbles
- Regulation and stabilization of cavitation intensity using ultrasound by Sonotrodes



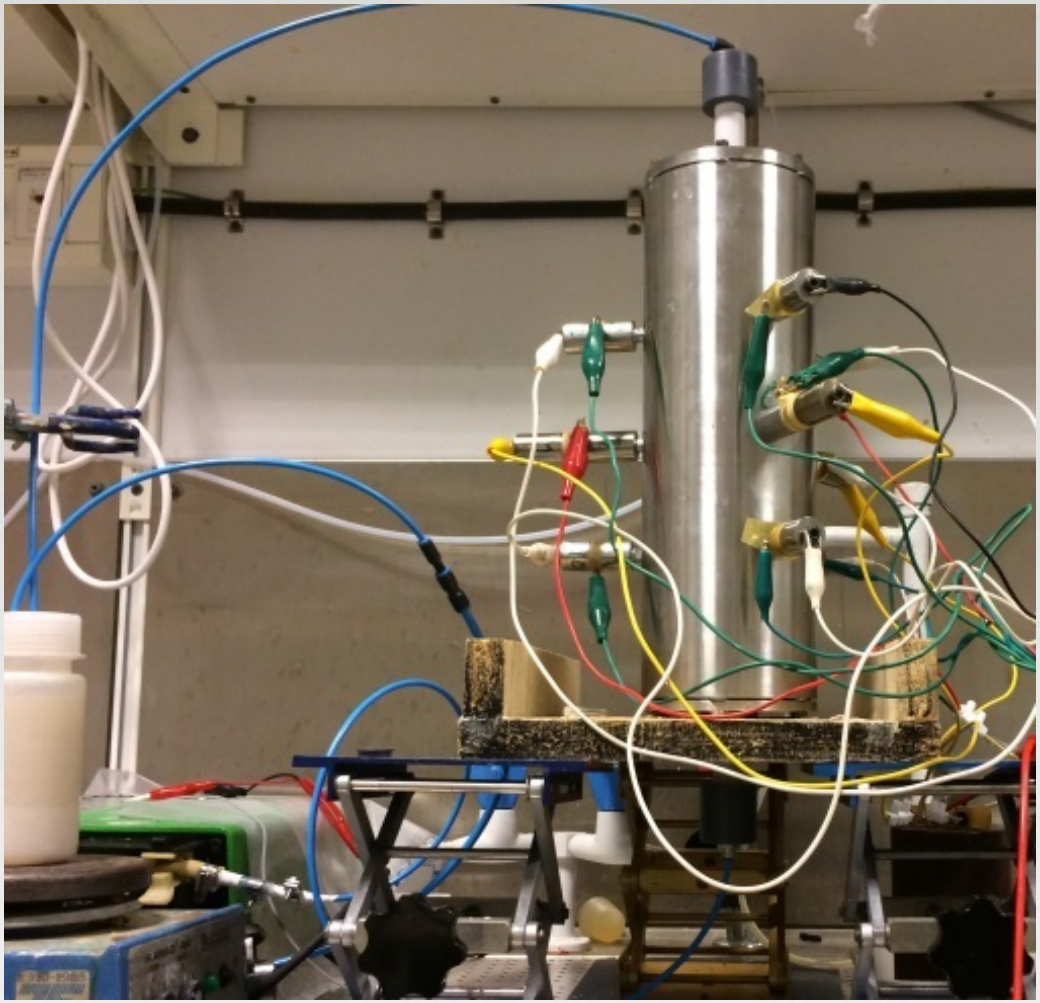
Numerical optimized reactor response



Optimum cavitation intensity?



Experimental set-up



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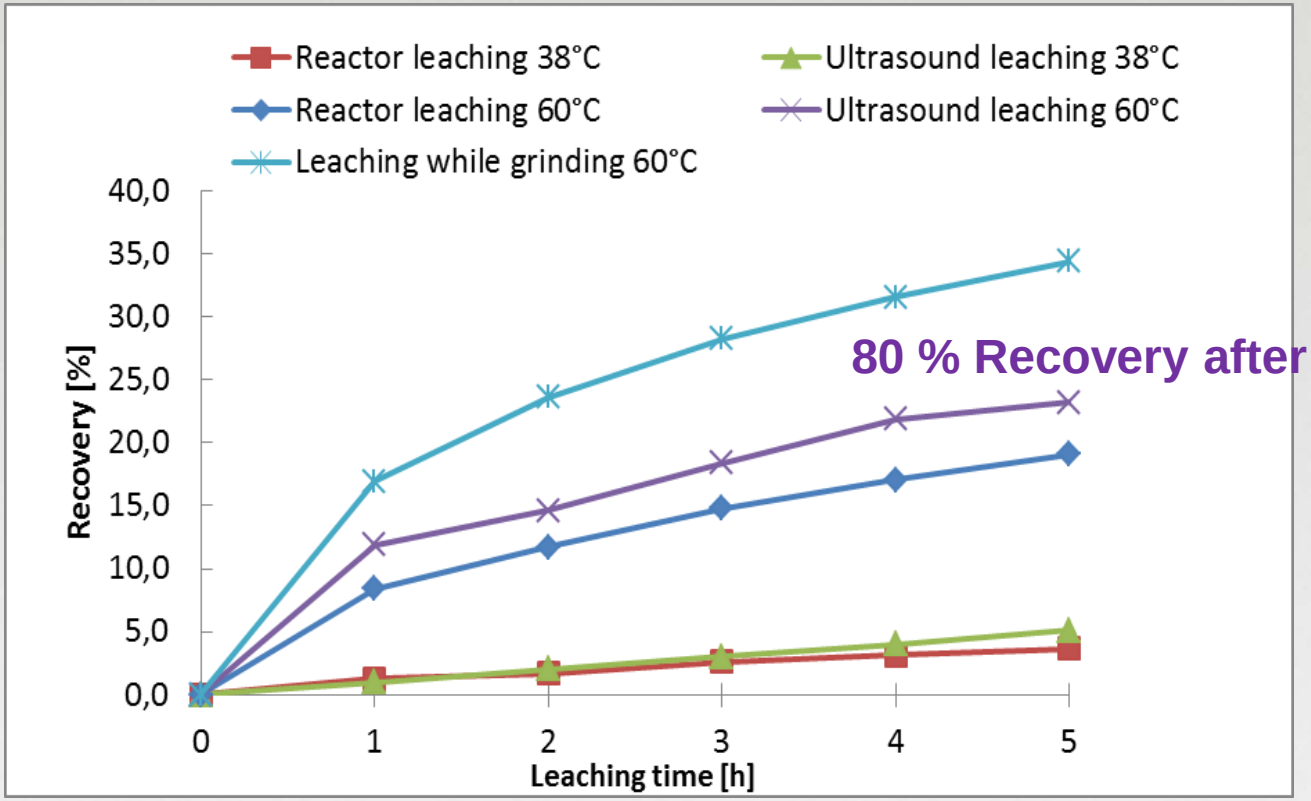
Results

- Ultrasound cavitation increased recovery by 21%
- Electric energy for ultrasound cavitation equivalent to 104 kWh/kg
- 60 degrees temperature and normal pressure.



80 % Recovery after 16 hours?

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New project proposal

- Increase temperature and static pressure to enable higher cavitation intensity and recovery rate
- Reduce process temperature relative to the boiling temperature of the leaching reagent
- Further development of the nozzle for the initiation of cavitation bubbles by flow
- Fine tune the developed reactor design with respect to various types of Scheelite material and leaching conditions
- Careful benchmark with alternative technologies energy use
- Tie an equipment manufacturer to the project

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