

Energy efficient intensification of leaching by ultrasound controlled cavitation

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Project partners:

Engineering Acoustics, Luleå University of Technology
Process Metallurgy, Luleå University of Technology
University of Turin

With support from Boliden



Purpose and Goals

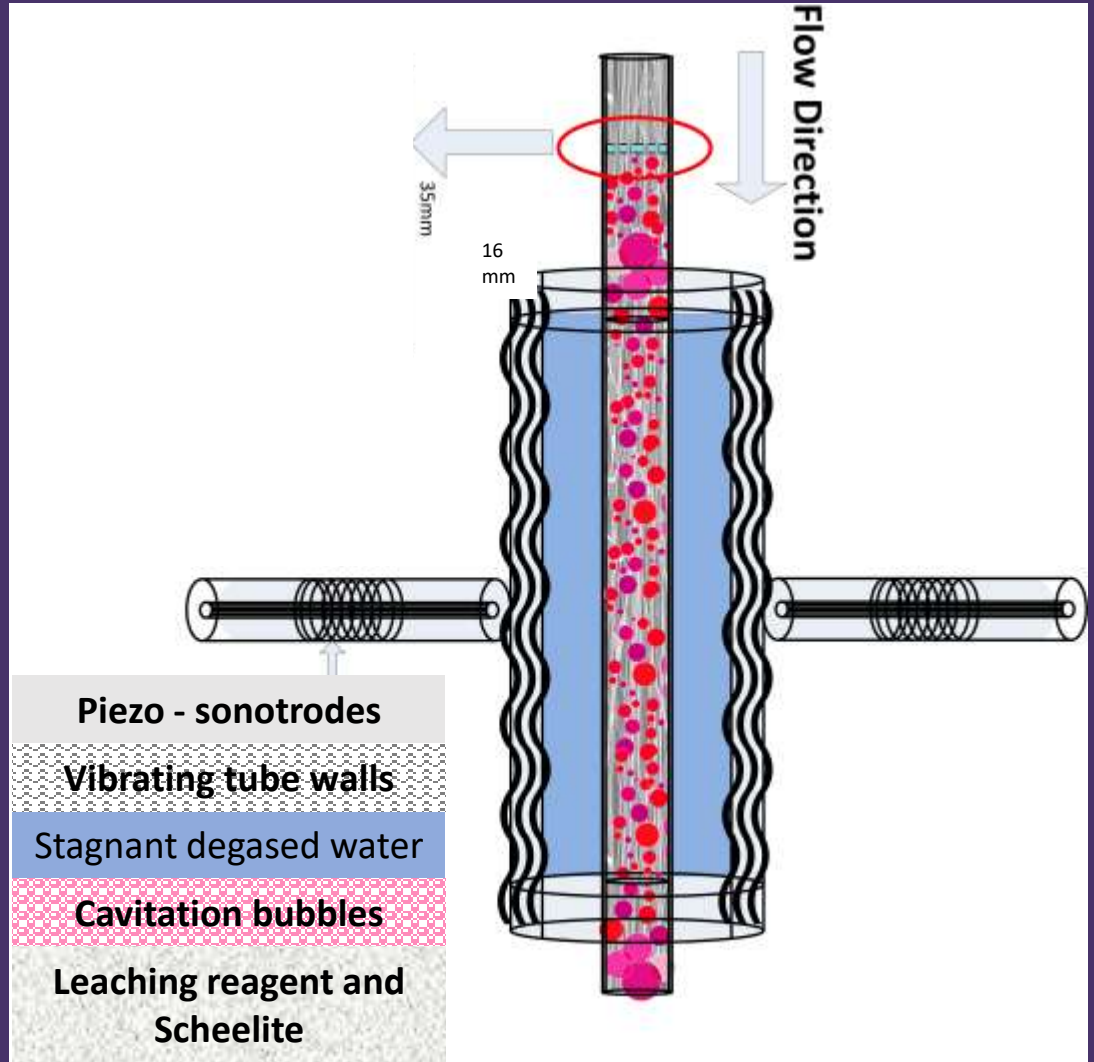
- Optimize a scalable hydrodynamic and ultrasound cavitation reactor for intensified leaching
- Increase tungsten recovery rate when leaching scheelite concentrate in sodium hydroxide
- Obtain a sustainable leaching process at lower temperature and pressure compared to an autoclave (220°C and 20 bar)

Reactor Concept

Hypothesis: *Ultrasound can intensify a leaching process*

Phase 1:
Hydrodynamic initiation
of cavitation bubbles

Phase 2:
Optimization of
cavitation intensity by
Sonification

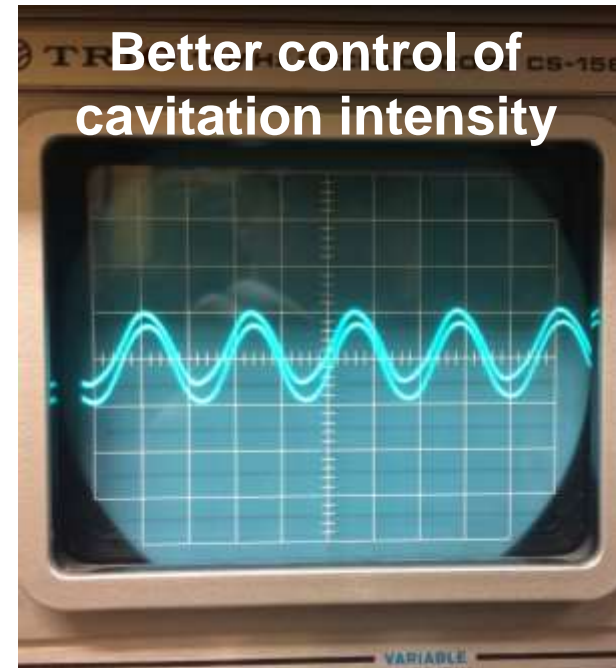
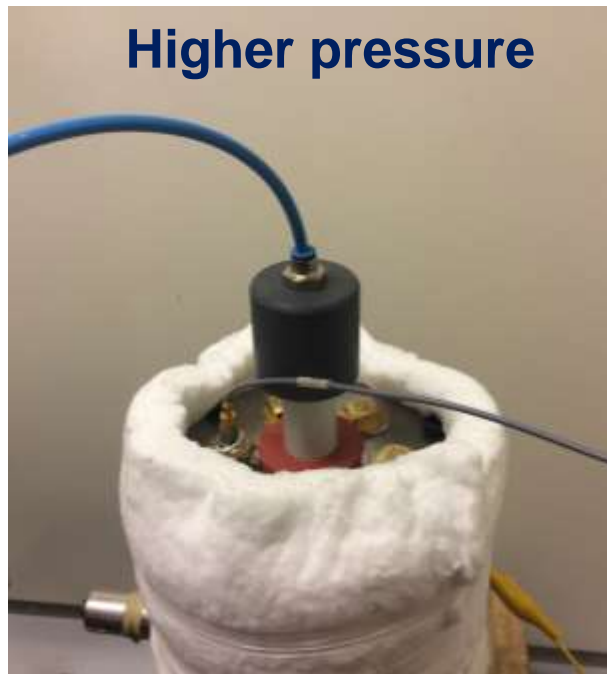


Improved Reactor Design

Increased temperature

Higher pressure

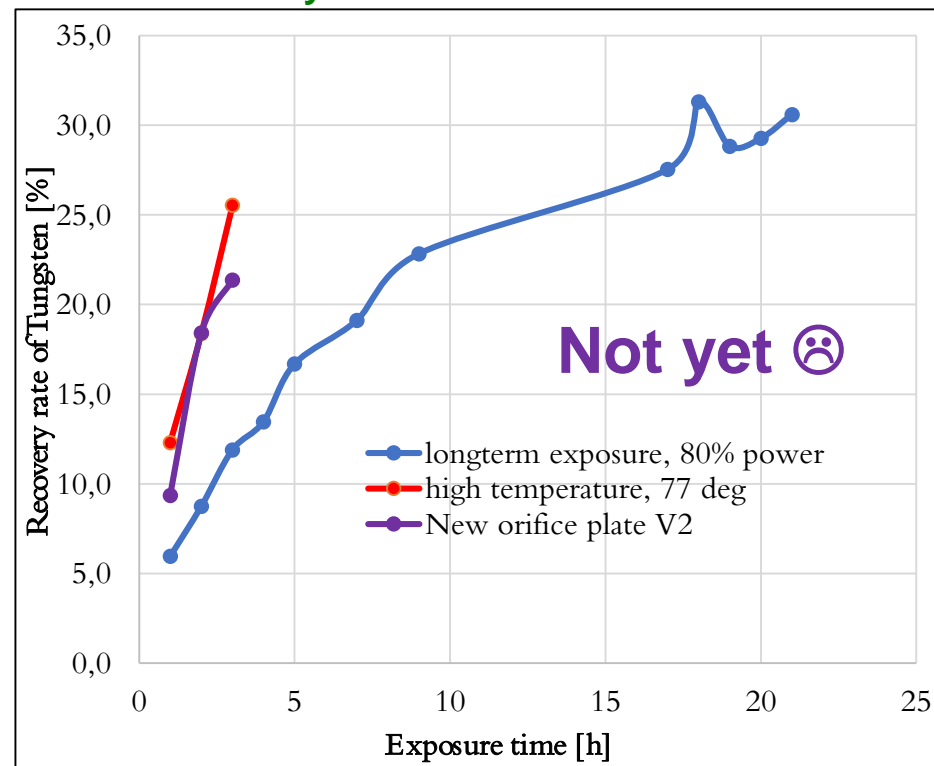
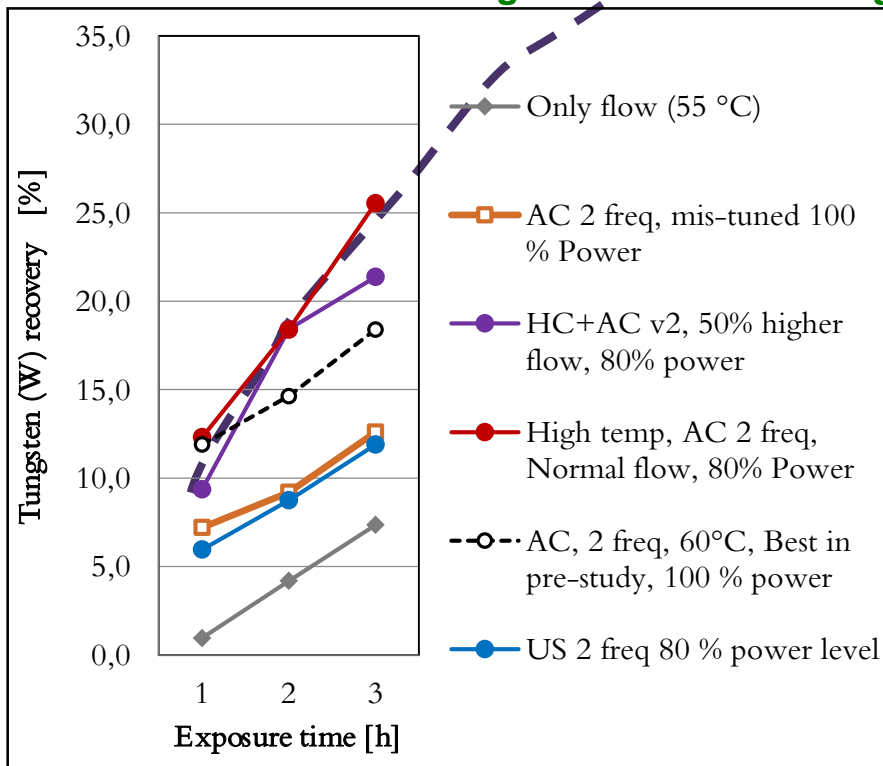
Better control of cavitation intensity



Experimental Results

- The new nozzle for hydrodynamic cavitation works!
- Ultrasound cavitation increases recovery by 80 %
- Maximum recovery rate is not yet reached
- **Microwave leaching at 20 bar and 170°C gives 77% recovery**

**95 %
recovery
after 16h?**



The way forward

- Increase the reactor size by factor 10 (**manufacturer of 4 m tubes found**)
- Higher cavitation intensity and recovery rate at 80°C or 100°C, and 8 bar static pressure (**requires better cooling**)
- Increase hydrodynamic cavitation intensity using the new nozzle at higher flow speed (**flow direction against gravity**)
- Fine-tune the up-scaled reactor design with respect to particle size of scheelite and leaching conditions (**higher temperature**)

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