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Comparative study of the mechanisms of ultrasonic, alkaline, and sono-alkaline pretreatment of industrial biosludge

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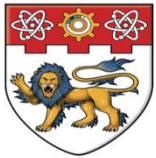
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Comparative Study of Ultrasonic, Alkaline, and Sono-Alkaline Pre-treatment on Industrial Secondary Biosludge



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Your Global Research & Technology Partner

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Biotechnology Center*

Wastewater and Biosolids Treatment and Use

Otranto, Italy



Introduction



<http://greenislands.se/2012/06/sludge-seminar-in-helsingborg>

**Anaerobic
digestion**



✓ **Biosludge solidification**
✓ **Energy recovery**

**AD of
biosludge**



✓ **Low biodegradability**
✓ **Slow digestion process**

**Pretreatment
methods**



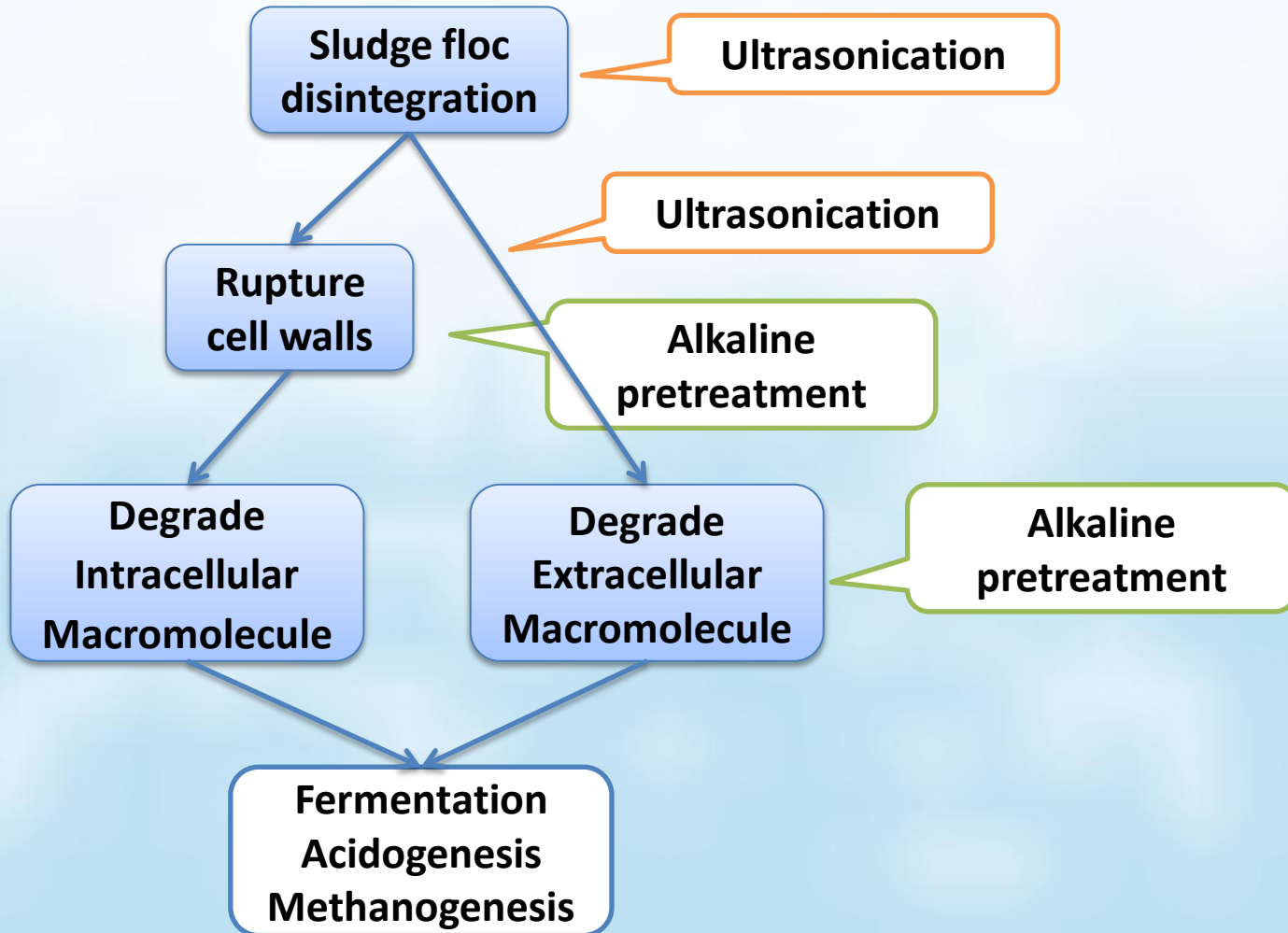
✓ **Biological, Chemical,
Biochemical, Thermal, Physical**

➤ Feed Biomass

- Generated from aerobic industrial wastewater treatment process
- Low SCOD/TCOD
- High VS/TS
- Low Biogas generation during BMP test

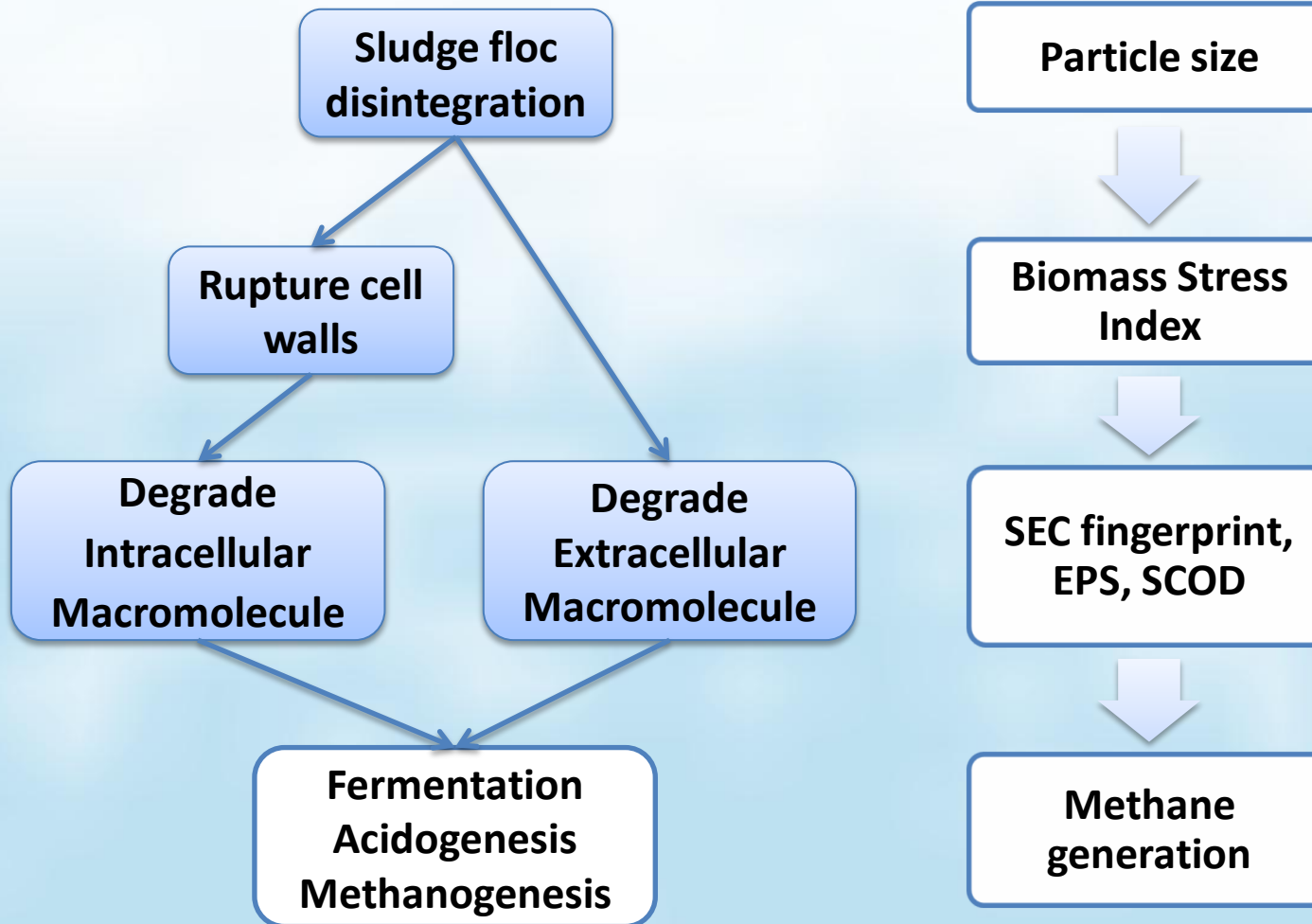


➤ Hypothesis

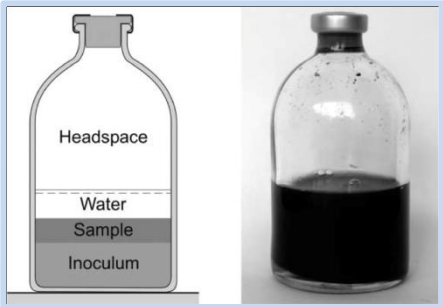


Methodology

➤ Process flow



➤ Experimental design

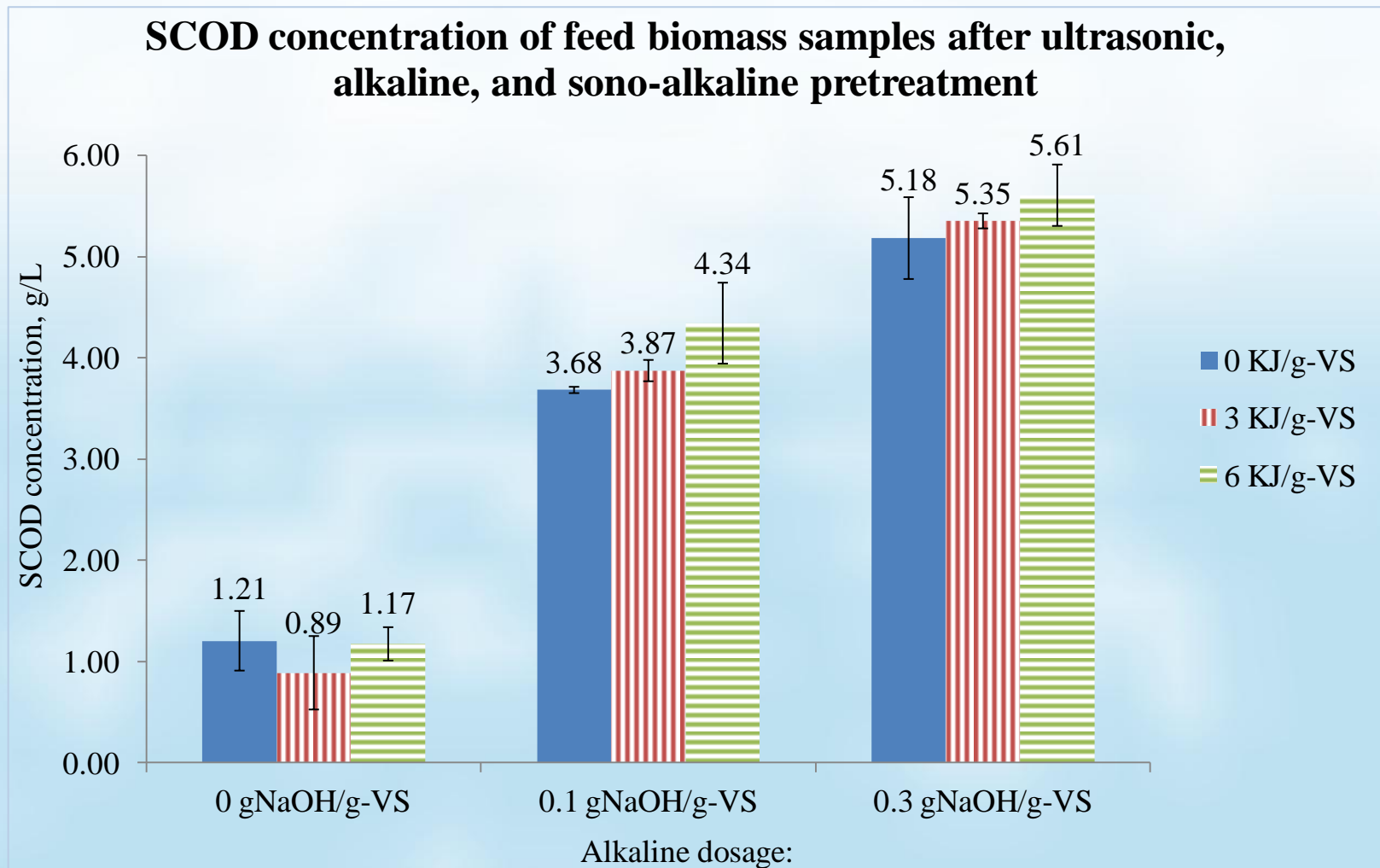


Alkali Dosage NaOH/TS	Ultrasonication Specific Energy Input		
	0 KJ/gVS	3 KJ/gVS	6 KJ/gVS
0 g/g			
0.1 g/g			
0.3 g/g			

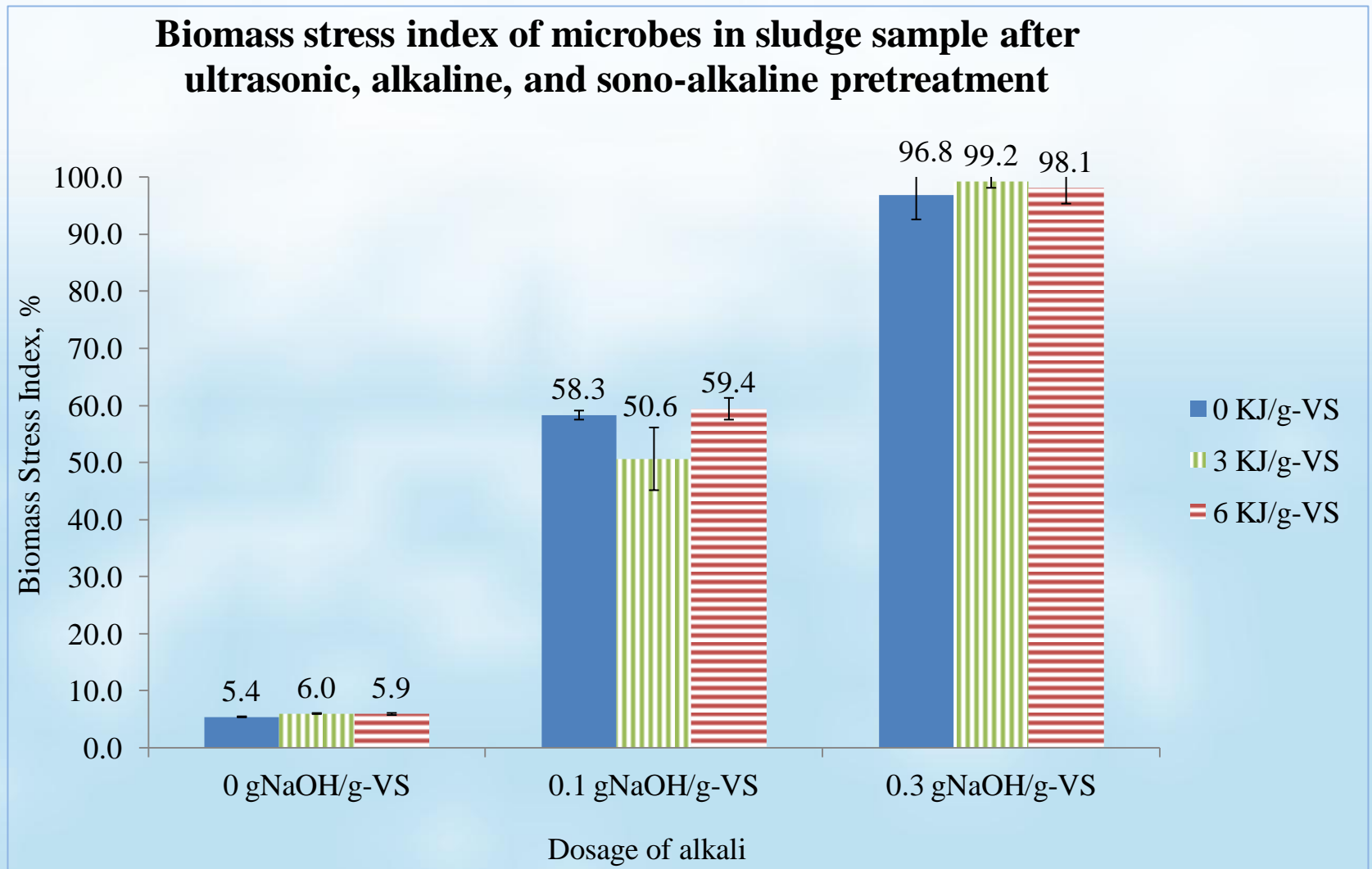
- Pretreatment time 24hrs
- Total Volume: 0.12L
- Working Volume: 0.08 L
- F/M: 1.5 gTCOD/gVSS

Results

➤ SCOD release

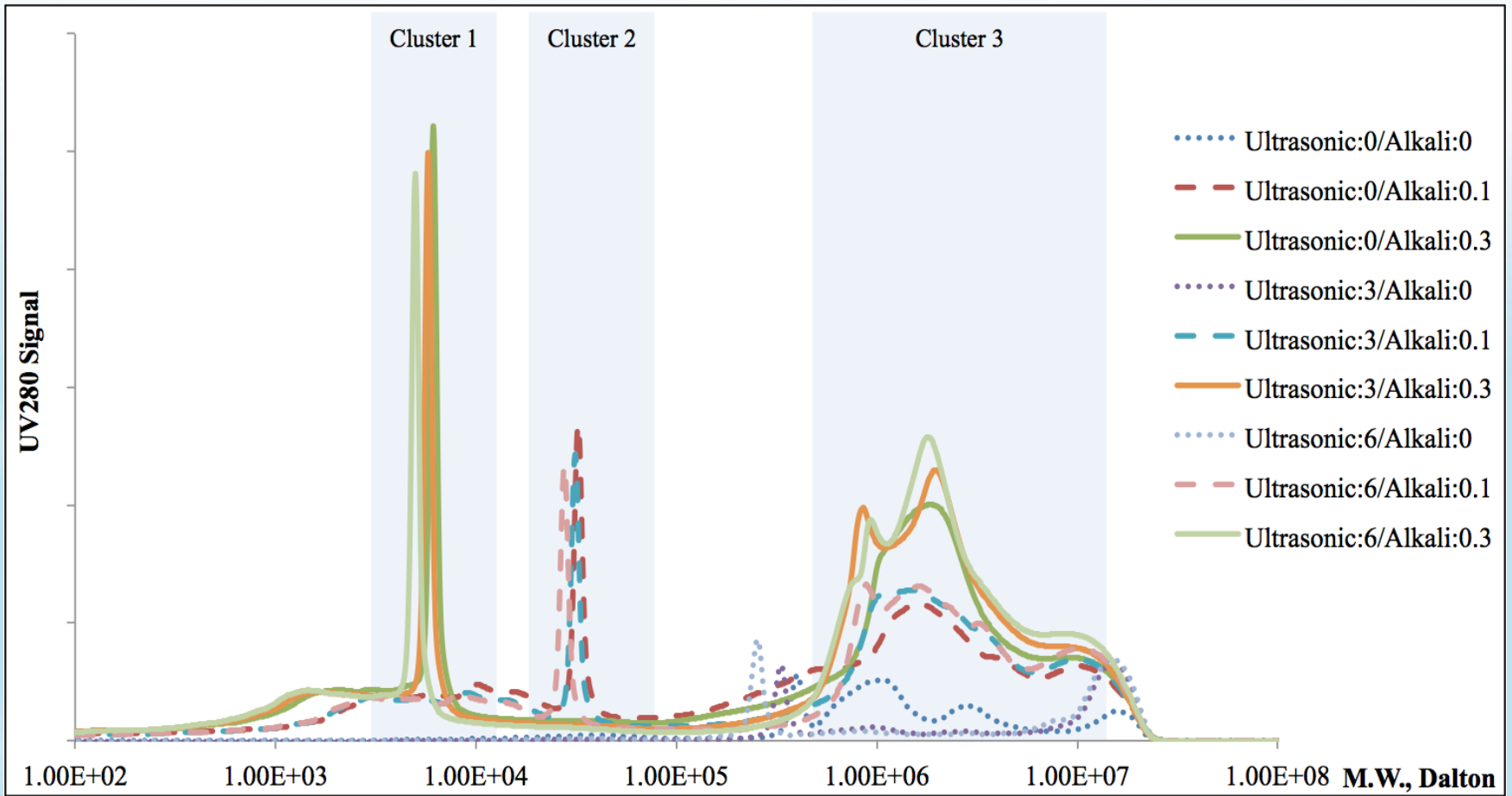


➤ Biomass stress index (BSI)



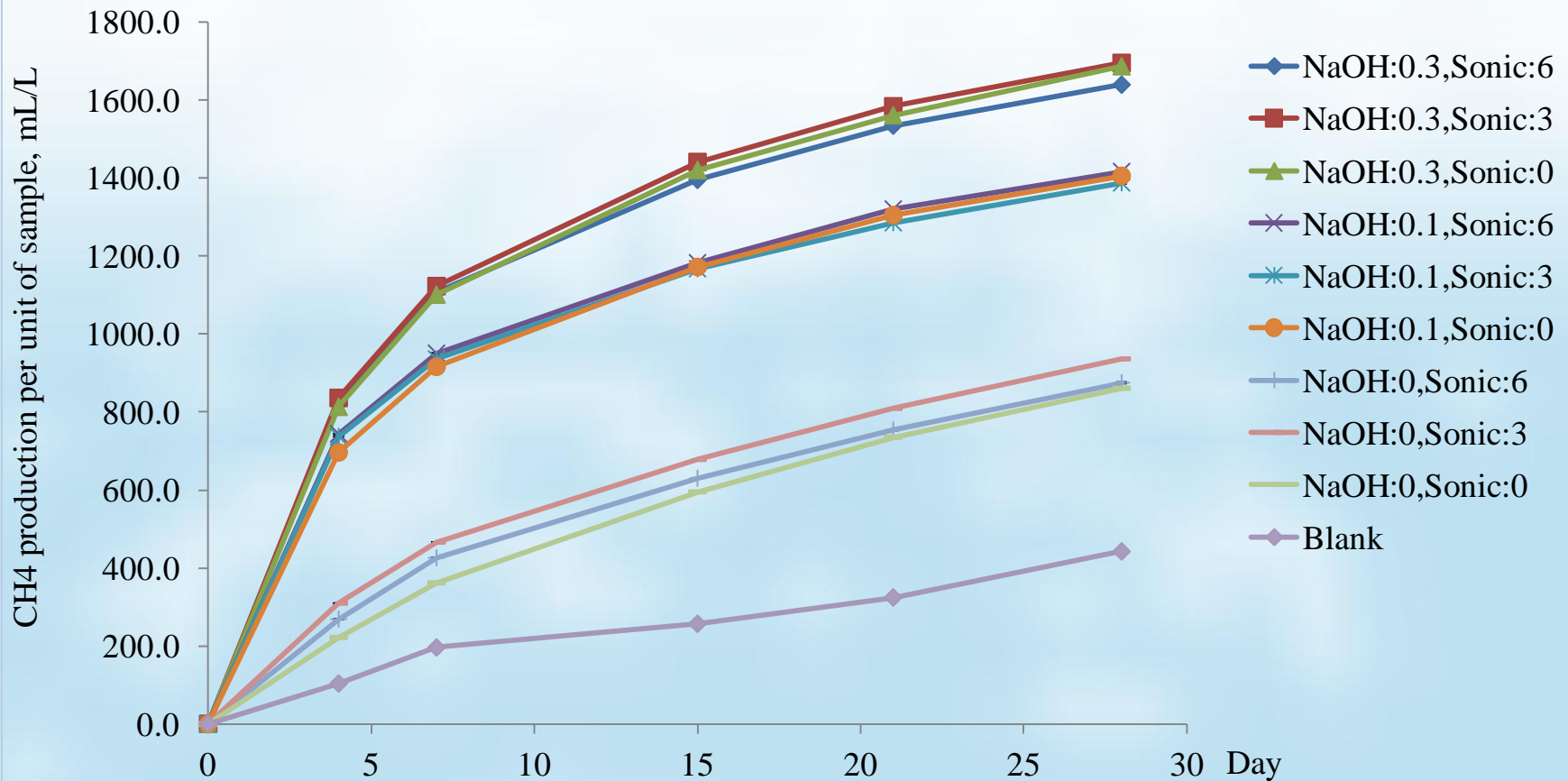
➤ SEC fingerprint

UV280nm detector signals of sludge samples after ultrasonic, alkaline, and sono-alkaline pretreatment

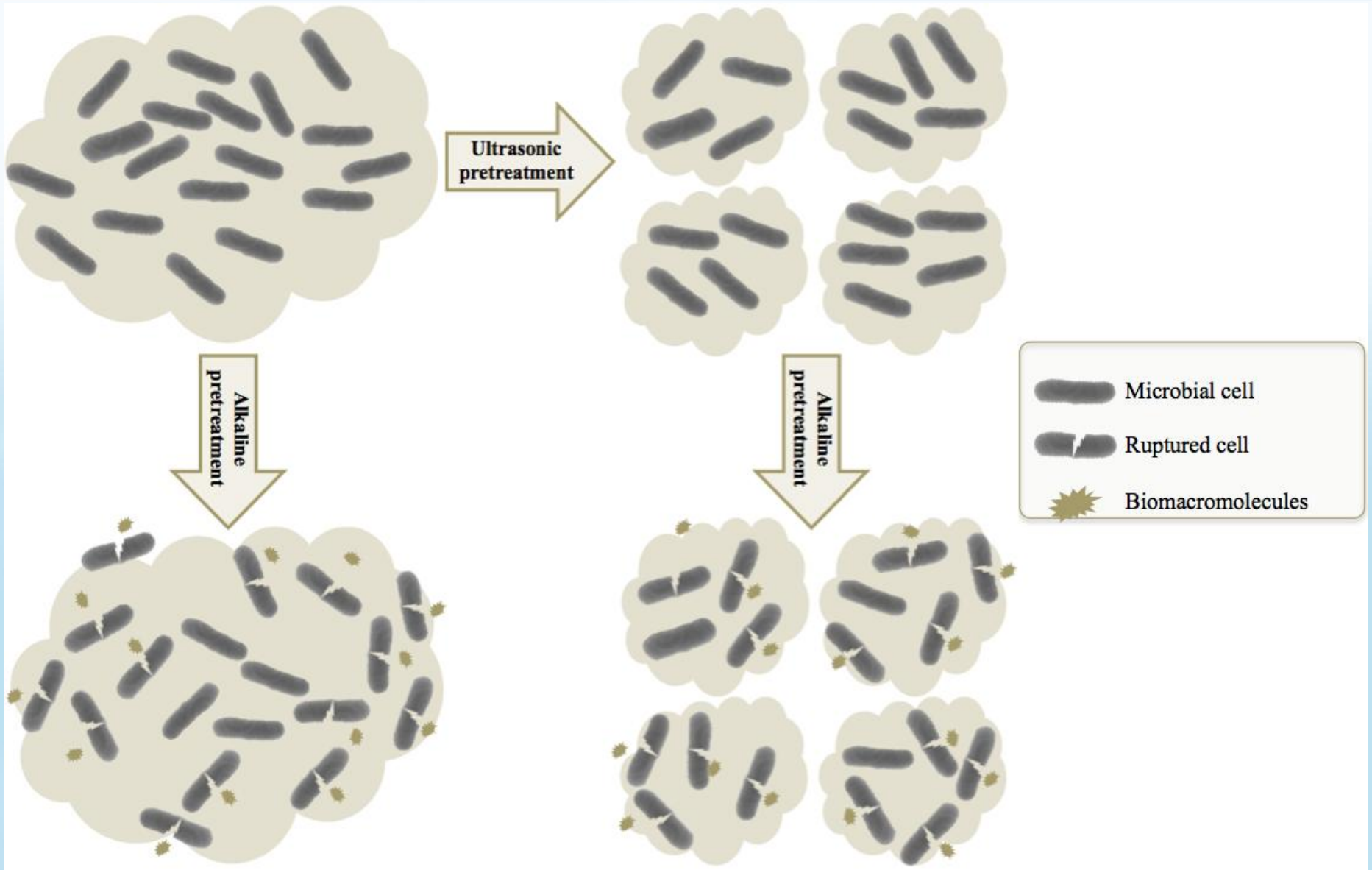


➤ Methane generation

Cumulative methane generation from BMP test after ultrasonic, alkaline, and sono-alkaline pretreatment



Discussion

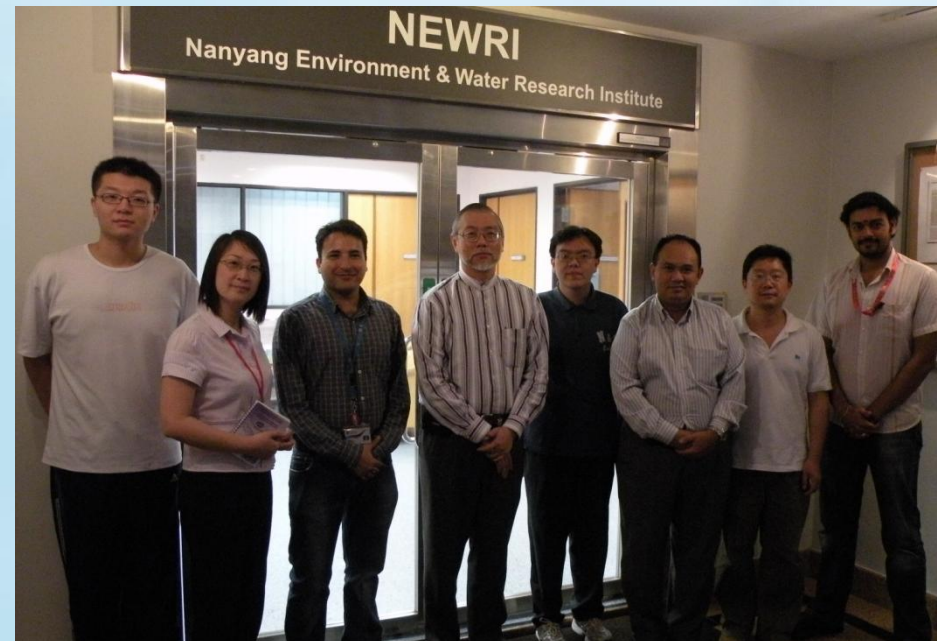


Conclusions

- Alkaline pretreatment could promote the COD and EPS solubilisation, rupture of microbial cells, decompose biomacromolecules, and enhance methane generation. However, it is not efficient to disintegrate large sludge particles
- Ultrasonic pretreatment could disintegrate large sludge particles, but has less contribution to stimulate COD and EPS solubilisation, rupture of microbial cells, or decomposition of biomacromolecules. Consequently, it hardly enhances methane generation
- Sono-alkaline pretreatment shows similar treatment effect as alkaline treatment with better performance in particles disintegration
- The key to enhance methane generation shall be solubilisation of SCOD and EPS, rupture of microbial cells, and decomposition of biomacromolecules.

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- Team members



THE POWER OF WATER

The Flow of Hope

Thank You