

Characteristics and effect of US parameters and surface stabilizer on the sonocrystallization process of paracetamol

Mathijs Paredis

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The ultrasound wave field on the sonocrystallization of paracetamol was characterized at standing or traveling waves. Different surface stabilizers (PUR, copper and glass) were used to alternate the wave form. The effect of cavitations (stable or transient) on the crystals and the process was investigated at different frequencies (41–1140 kHz), surface stabilizers and calorimetric input power (4-15 W). The obtained data was combined with crystallization data e.g. MZW, CSD and crystal shape. Also the effect of overhead stirring on the US waves and cavitations was studied.

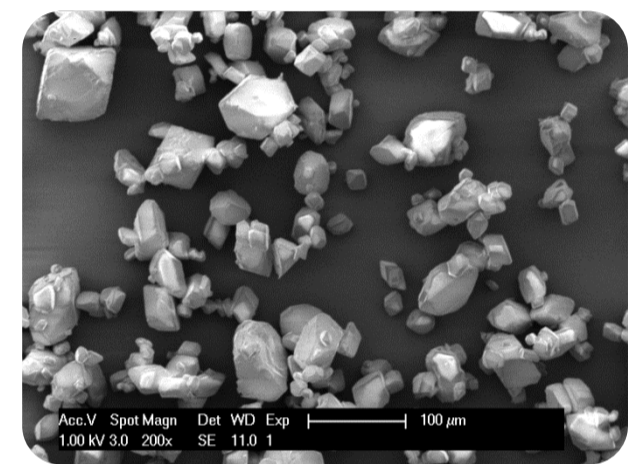
MZW

The metastable zone width was measured as the difference between the solubility temperature and the observed nucleation temperature.

frequency (kHz)	PUR			glass			copper			air		
	MZW (°C)	reduction (°C)	STDEV	MZW (°C)	reduction (°C)	STDEV	MZW (°C)	reduction (°C)	STDEV	MZW (°C)	reduction	STDEV
0	8,9		1,4	9,2		1,5	8,8		2,0	18,7		1,5
41	7,6	1,2	1,2	6,2	3,0	0,5	5,4	3,4	0,9	8,4	10,3	0,6
98	8,1	0,8	1,0	5,9	3,4	0,7	5,9	2,9	1,4	9,3	9,4	0,1
1140	9,0	-0,1	1,2	8,4	0,9	1,9	8,2	0,6	1,7	10,1	8,6	2,9

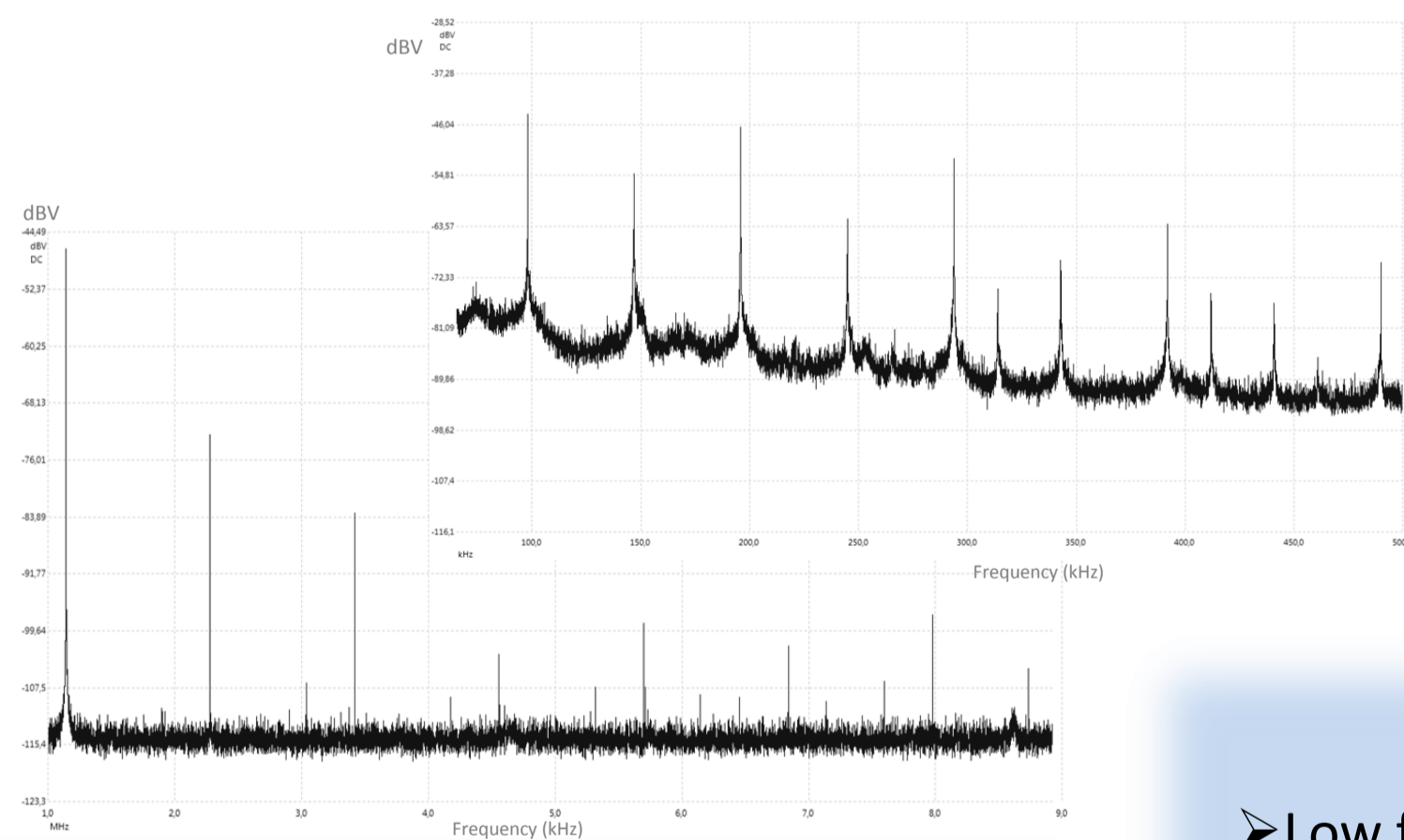
Crystal Shape

The crystal shape was measured using SEM



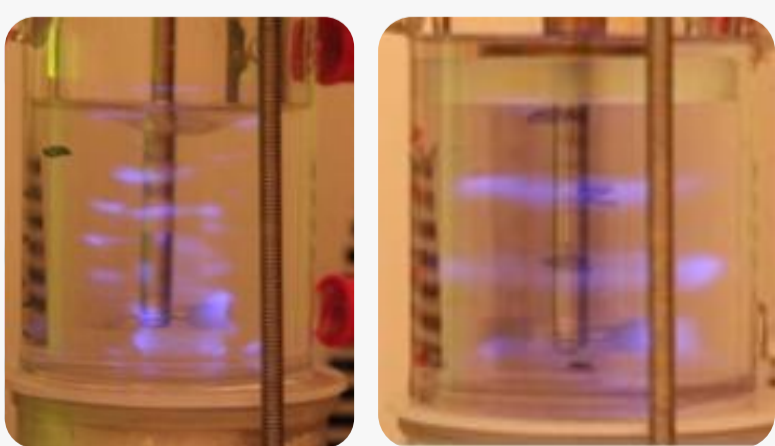
Cavitations

The cavitations were examined as noise (surface under chart) using a hydrophone



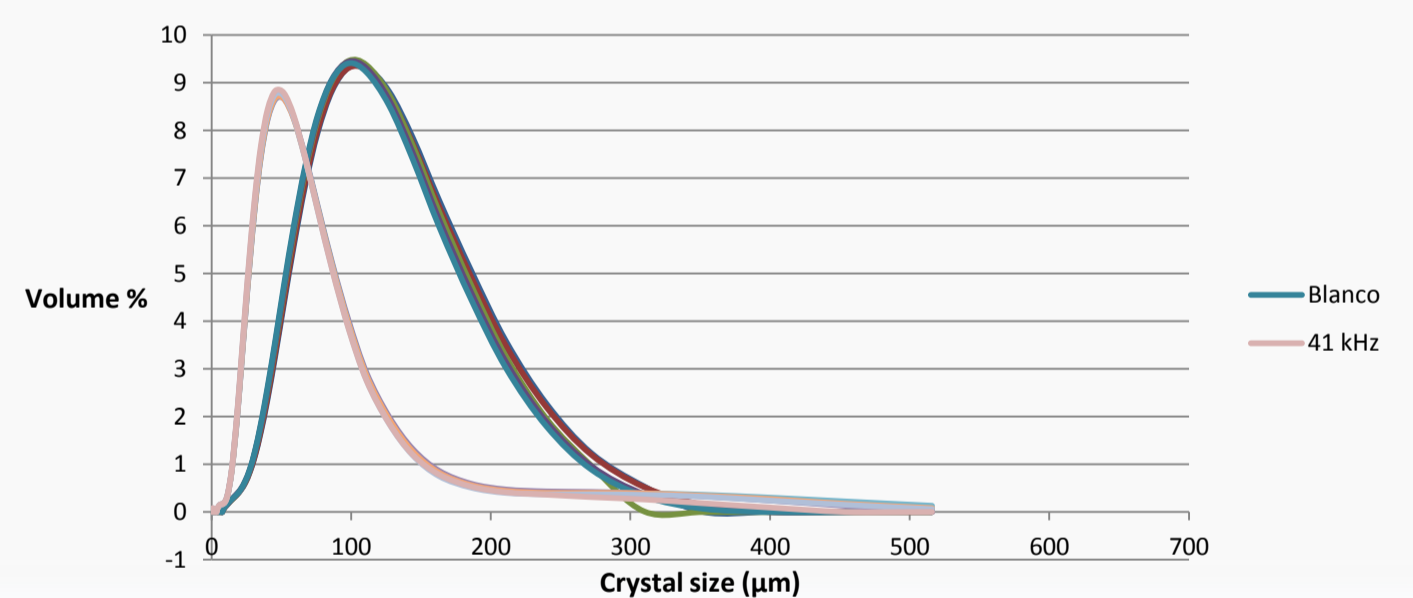
US waves

The wave type and pattern was characterized using sonoluminescence with luminol



CSD

The crystal size distribution was measured using a laser diffraction meter



Results

- Low frequencies, open systems and high intensities are beneficial for creating transient cavitations
- Standing waves, detected by a band pattern, are always present, but increase when using a reflection material
- The distance between the bands is $\frac{1}{2}$ wavelength
- Stirring is necessary to create a band structure, thus standing waves
- Standing waves and transient cavitations result in a lower MZW
- Transient cavitations will reduce the CSD
- No effect of the parameters was shown on the crystal size

Promotoren / Copromotoren: Dr. ing. Leen Braeken
Ing. Jeroen Jordens