

FABRICATION AND CHARACTERIZATION OF A MICRO-BOILING METER FOR HEAT TRANSFER MEASUREMENTS ON A SINGLE NUCLEATION SITE

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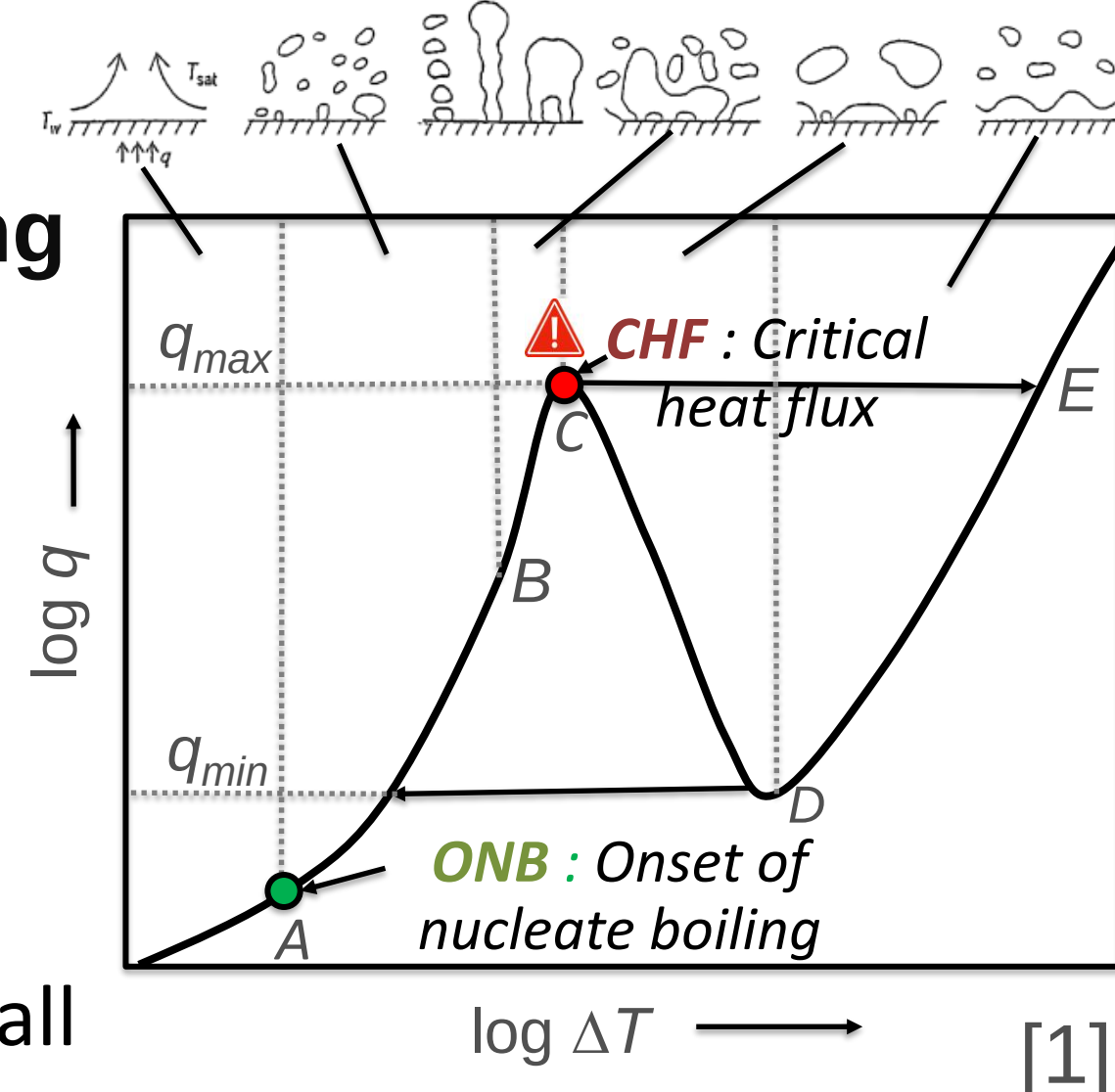
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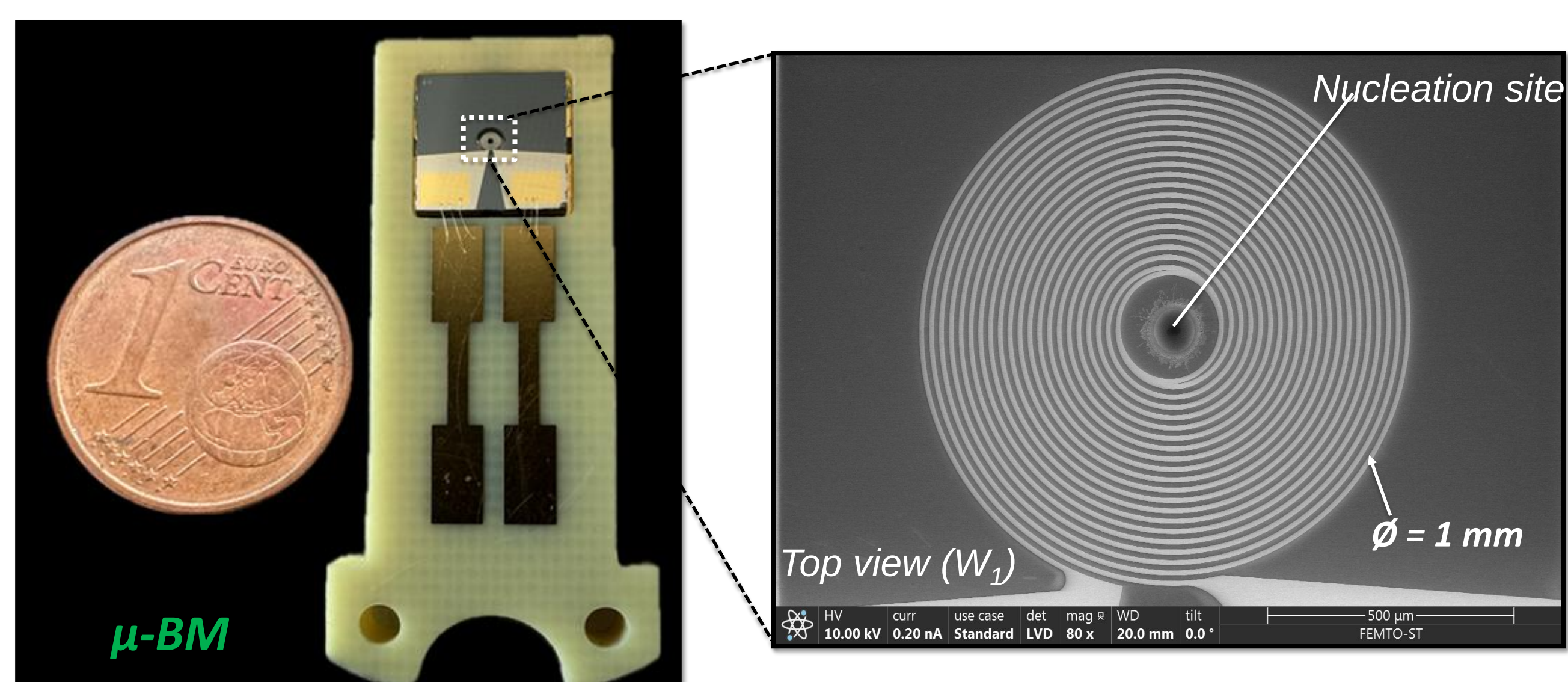
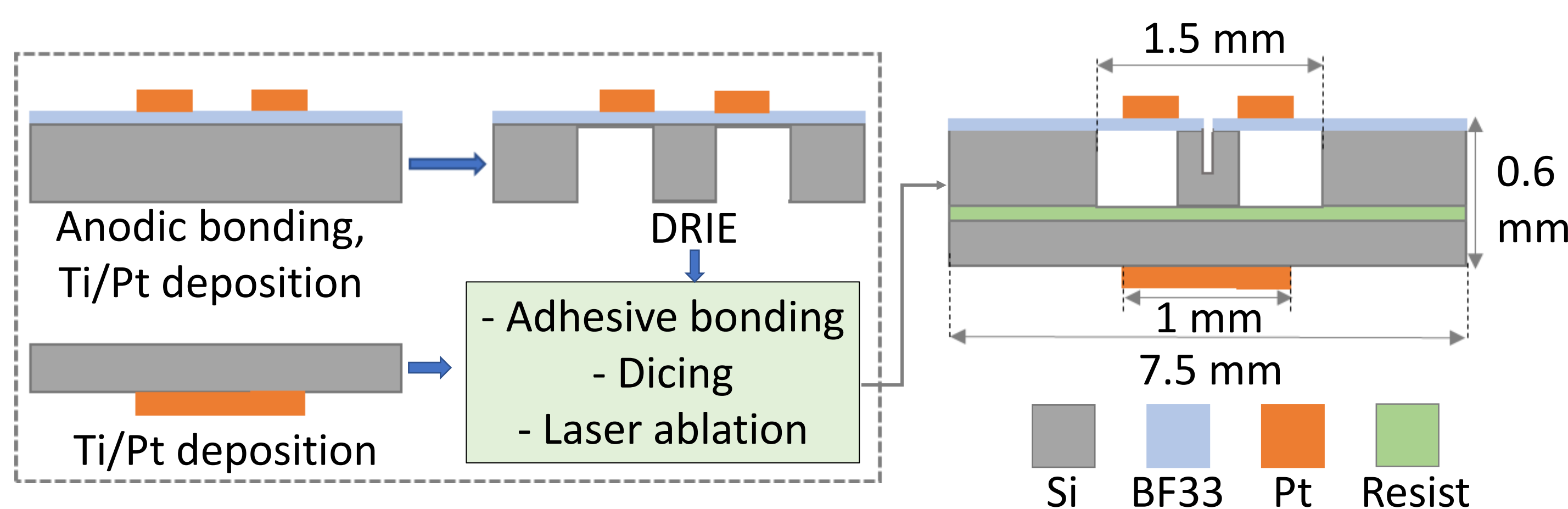
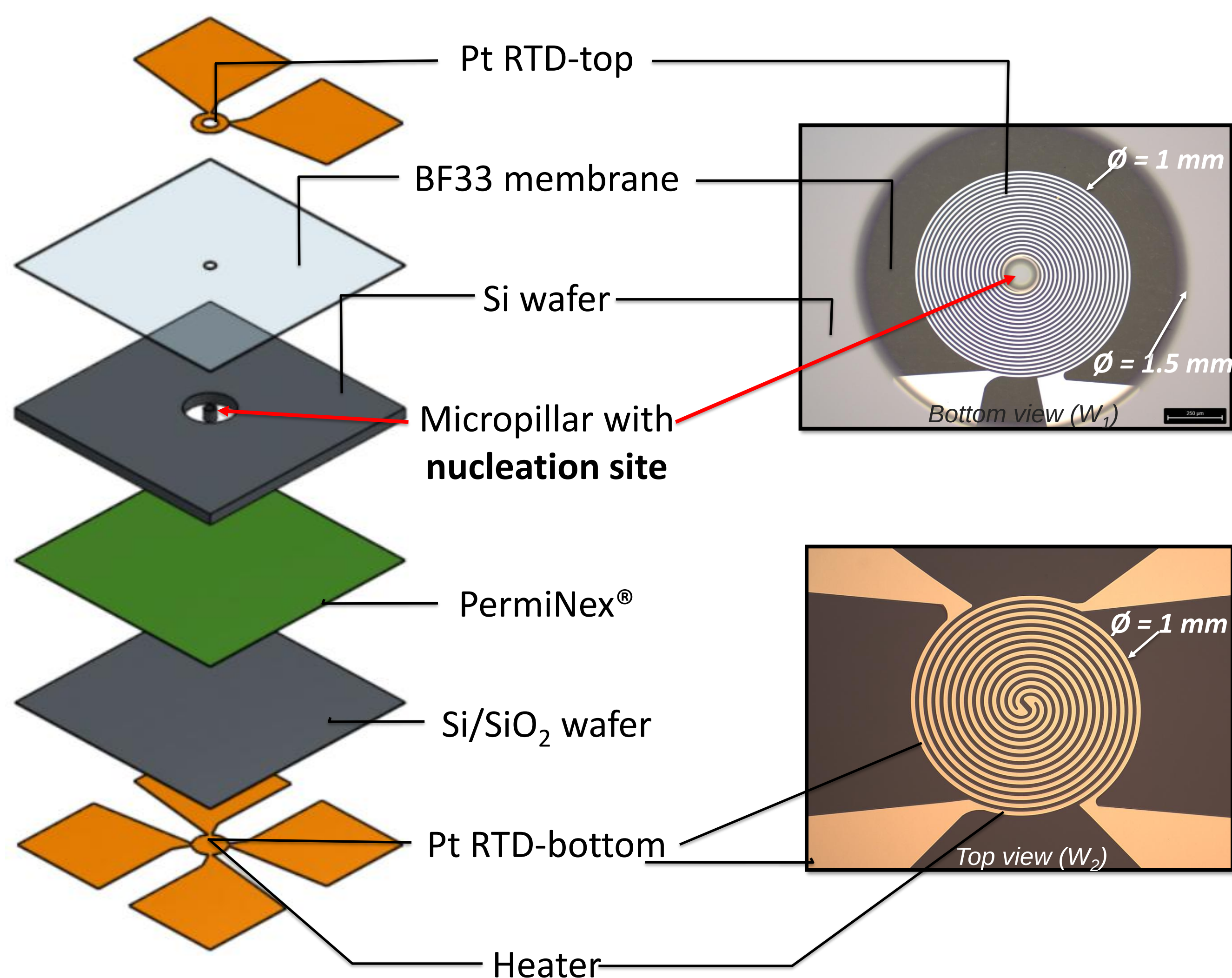
1. INTRODUCTION / CONTEXT

ANR TraThI :

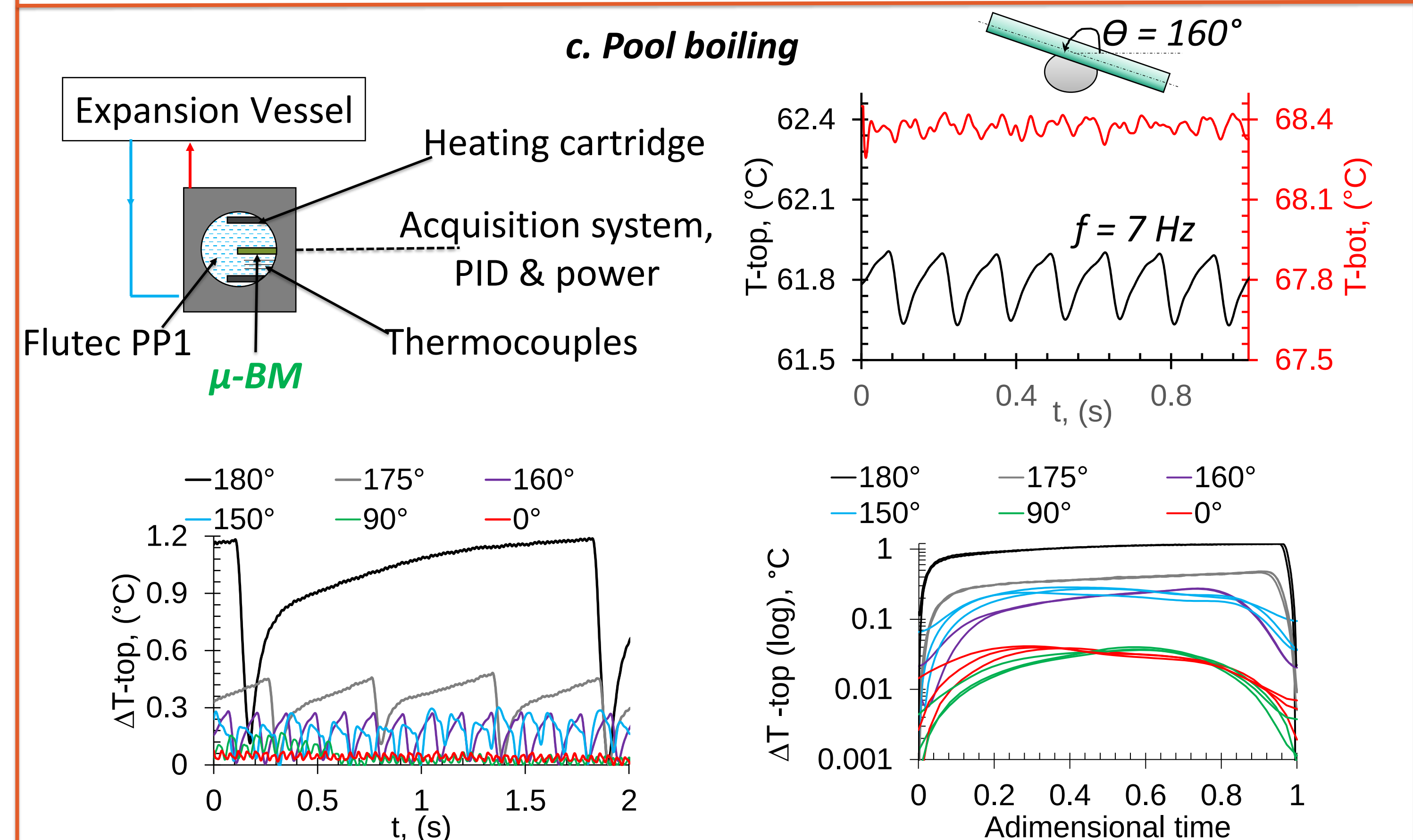
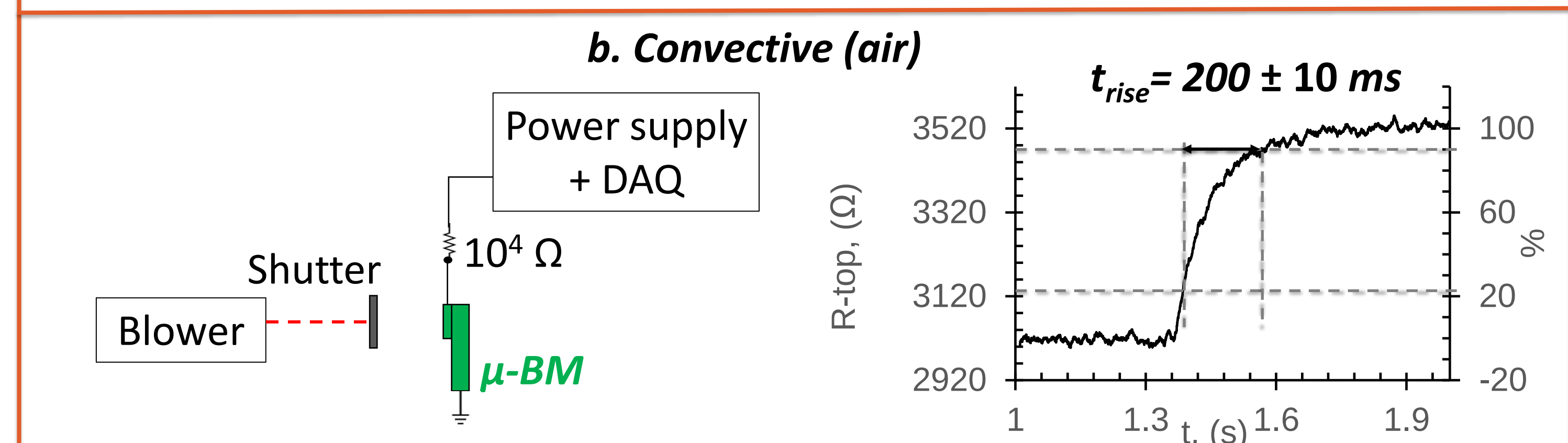
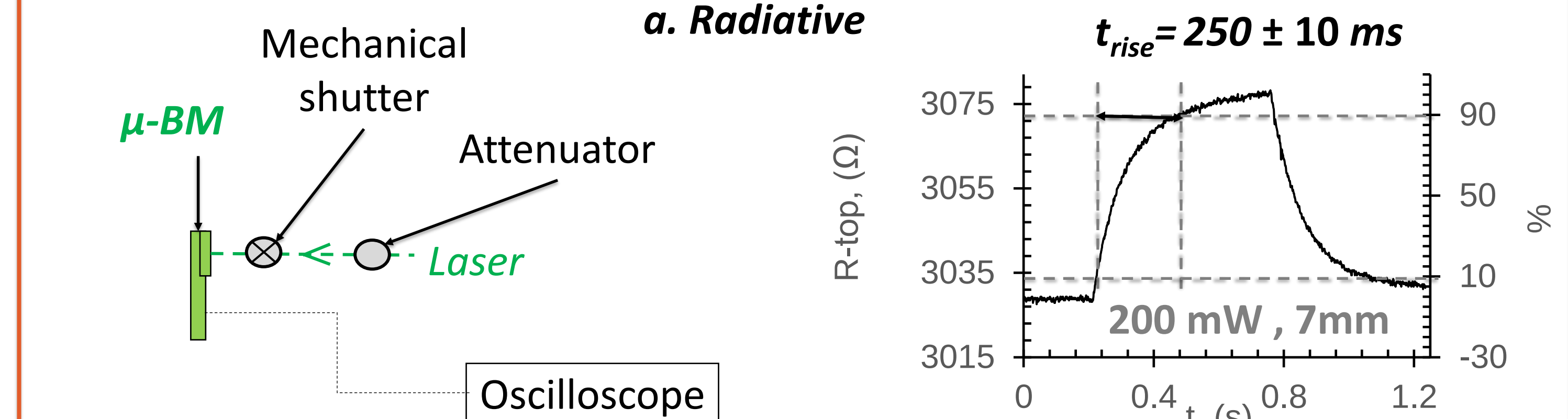
- Aim** : To measure **heat transfer** at wall-fluid interfaces during **pool boiling**
 - Focus** → **ONB** (without the effect of other bubbles)
 - Require** : **Boiling-meter (μ -BM)**
- Create** : one single bubble
- Sensors** : heat flux (q) and wall temperature (T_w)



2. DESIGN & MICROFABRICATION



3. DYNAMIC CHARACTERISATION



	Boiling meter	Parameter studied	Value
Radiative	μ -BM	avg, t_{rise} (ms)	215 ± 10 to 425 ± 10
Convective	μ -BM	avg, t_{rise} (ms)	200 ± 20
Droplet	μ -BM	avg, t_{rise} (ms)	25 ± 10
	C-BM	avg, t_{rise} (ms)	375 ± 10
Pool boiling	μ -BM	f, (Hz) ($\theta = 180^\circ \rightarrow 0^\circ$)	0.5 to 26.2

CONCLUSIONS & PERSPECTIVES

- Successfully developed a fully functional micro-boiling meter (μ -BM) with an **80% fabrication success rate**.
 - μ -BM showed **rapid thermal response (~25–425 ms)**, achieving **10–20× faster** performance than the commercial boiling meter (C-BM).
 - Pool boiling** : μ -BM successfully **captured single bubble** dynamics over the full tested range (0.5–26.2 Hz), while (C-BM) failed beyond 5–6 Hz.
- The μ -BM provides the **speed and reliability** required for next-generation pool boiling research.

Perspectives :

- Heat flux calibration of the μ -BM for quantitative thermal measurements.
- Systematic pool boiling experiments under wider operating conditions.