

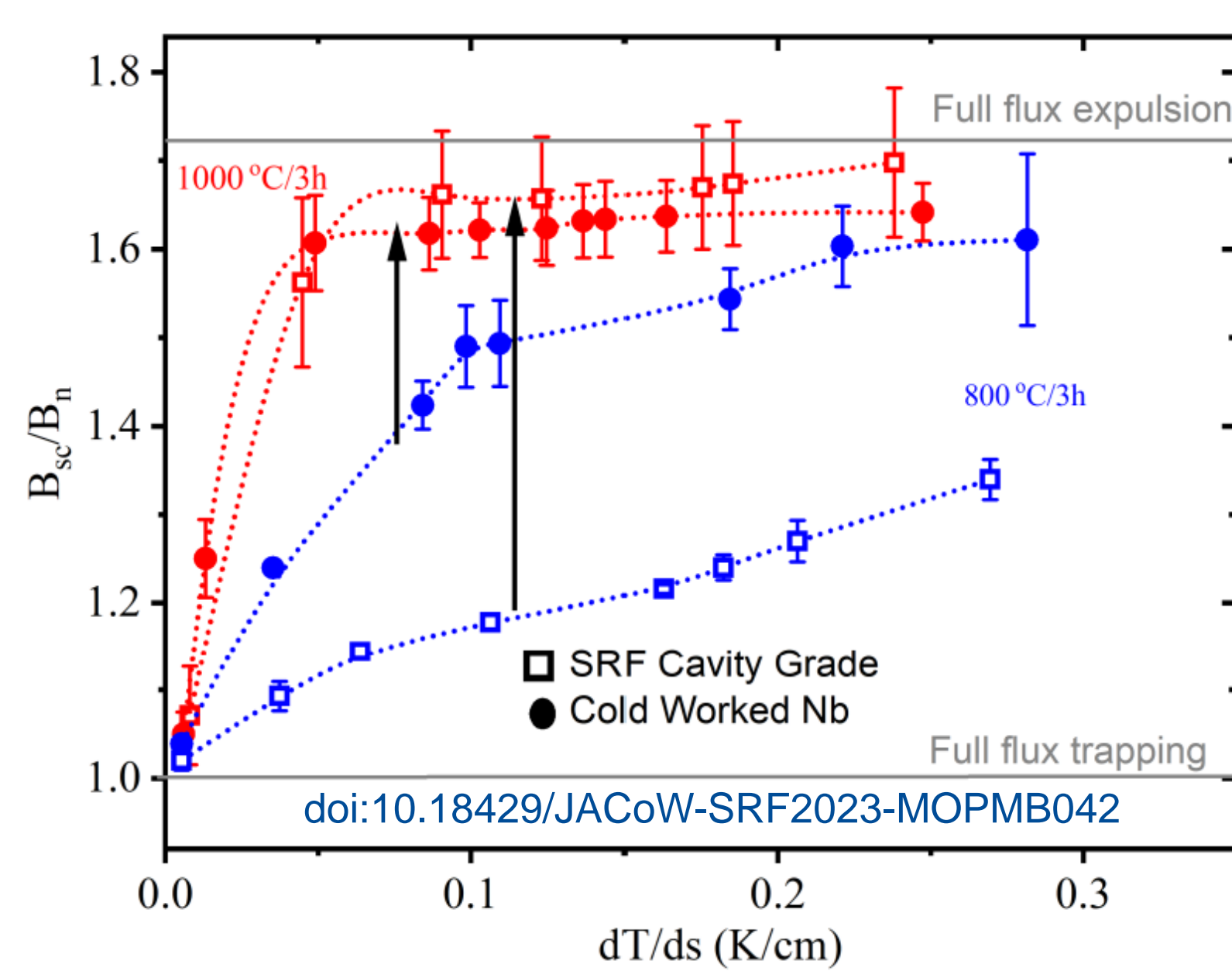
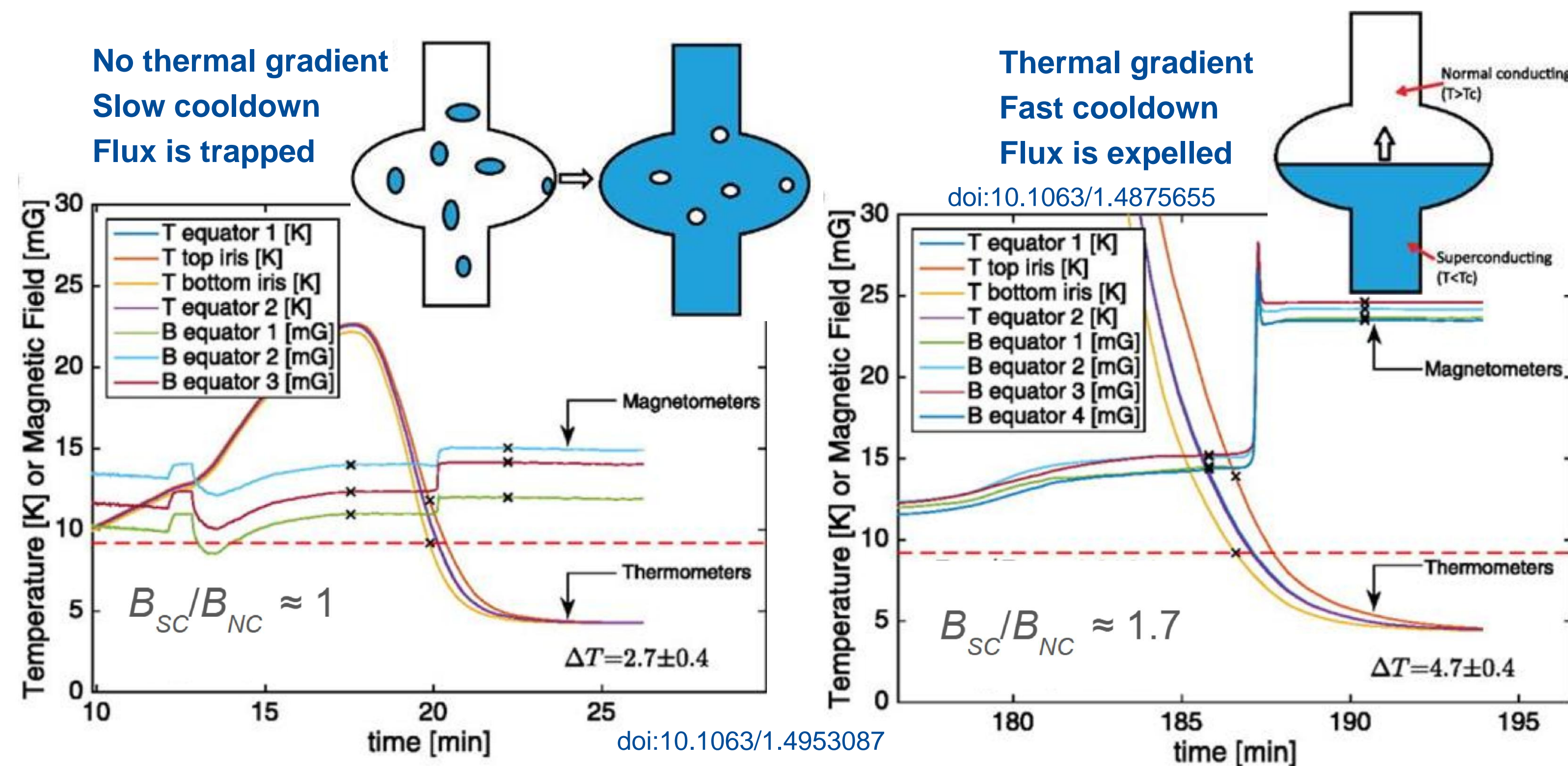
# Identifying the connections between grain growth and flux expulsion in low RRR niobium SRF cavities

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## Flux expulsion measurement

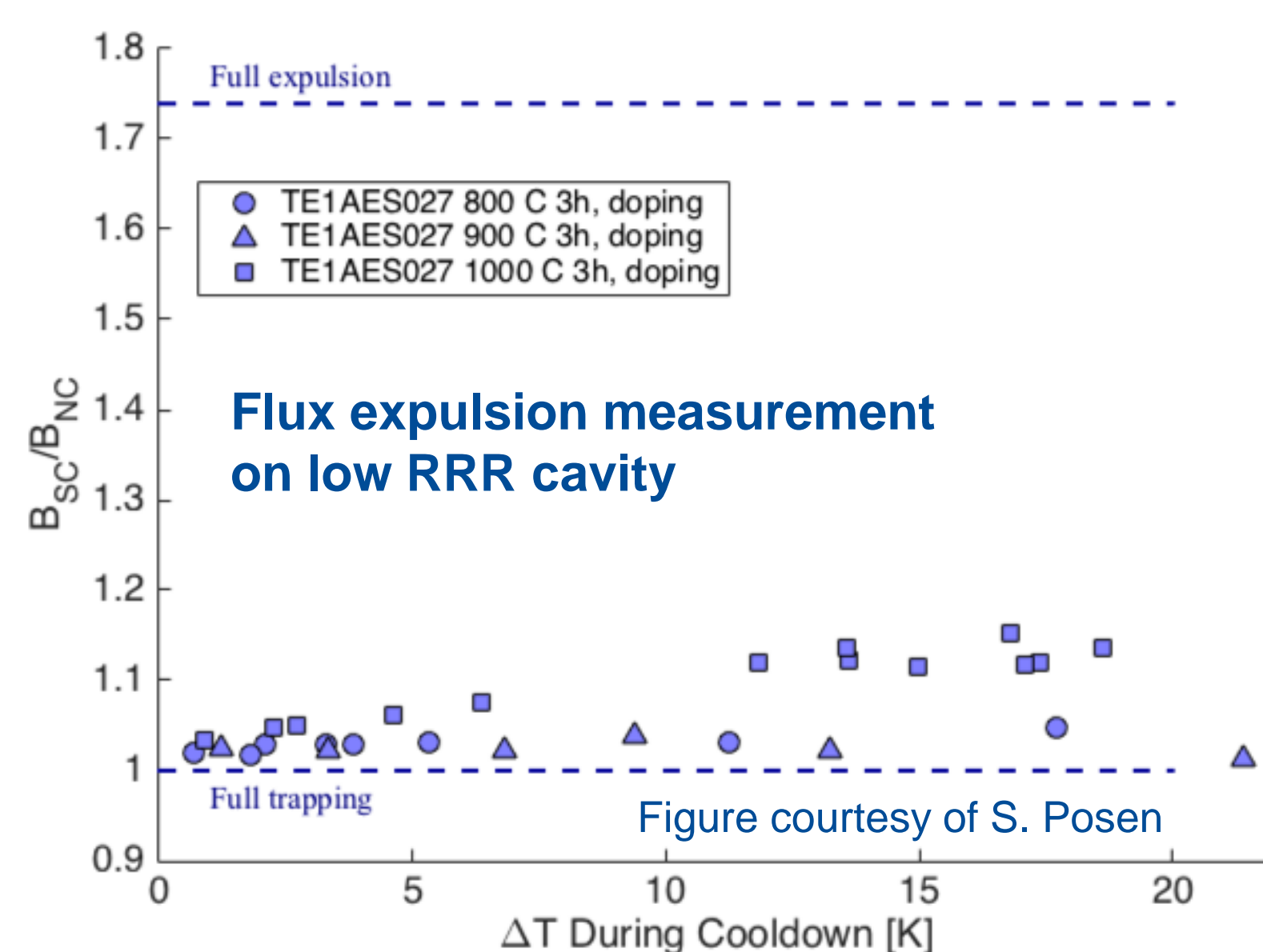


## Annealing to improve flux expulsion

- 1000 C x 3 hour bake generally enables good flux expulsion even at low thermal gradient
- High-temperature annealing associated with grain growth

$$\text{RRR} = \text{residual resistance ratio} = \frac{\rho(293 \text{ K})}{\rho(10 \text{ K})}$$

- High RRR for SRF is ~ 300
- Low RRR has higher concentration of **impurities/defects**



- Low RRR cavity still has poor flux expulsion after high-temperature anneal
- How does low RRR material respond differently to annealing?
- What is different about grain structure of this low RRR material?

## Characterization of low RRR material

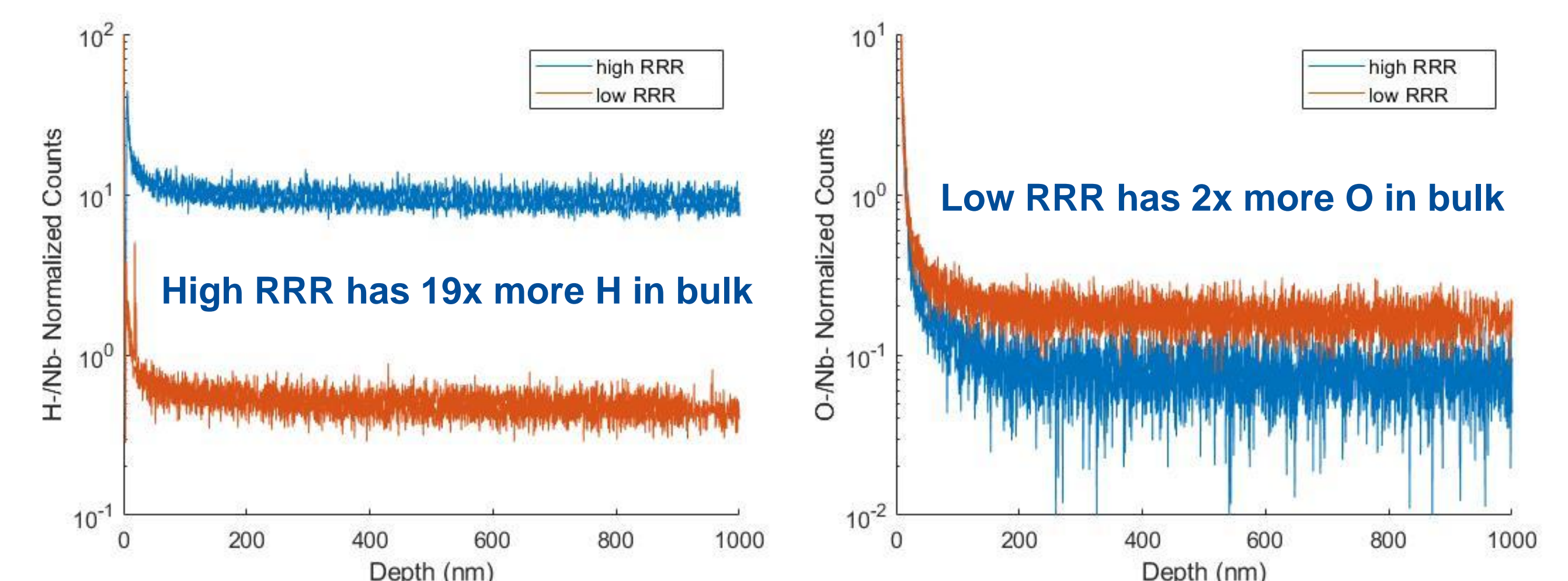
- Samples from same Nb sheet as cavity
- Impurities from secondary ion mass spectrometry
- RRR from 4-point resistance measurement
- Grain structure from electron backscatter diffraction

## Summary

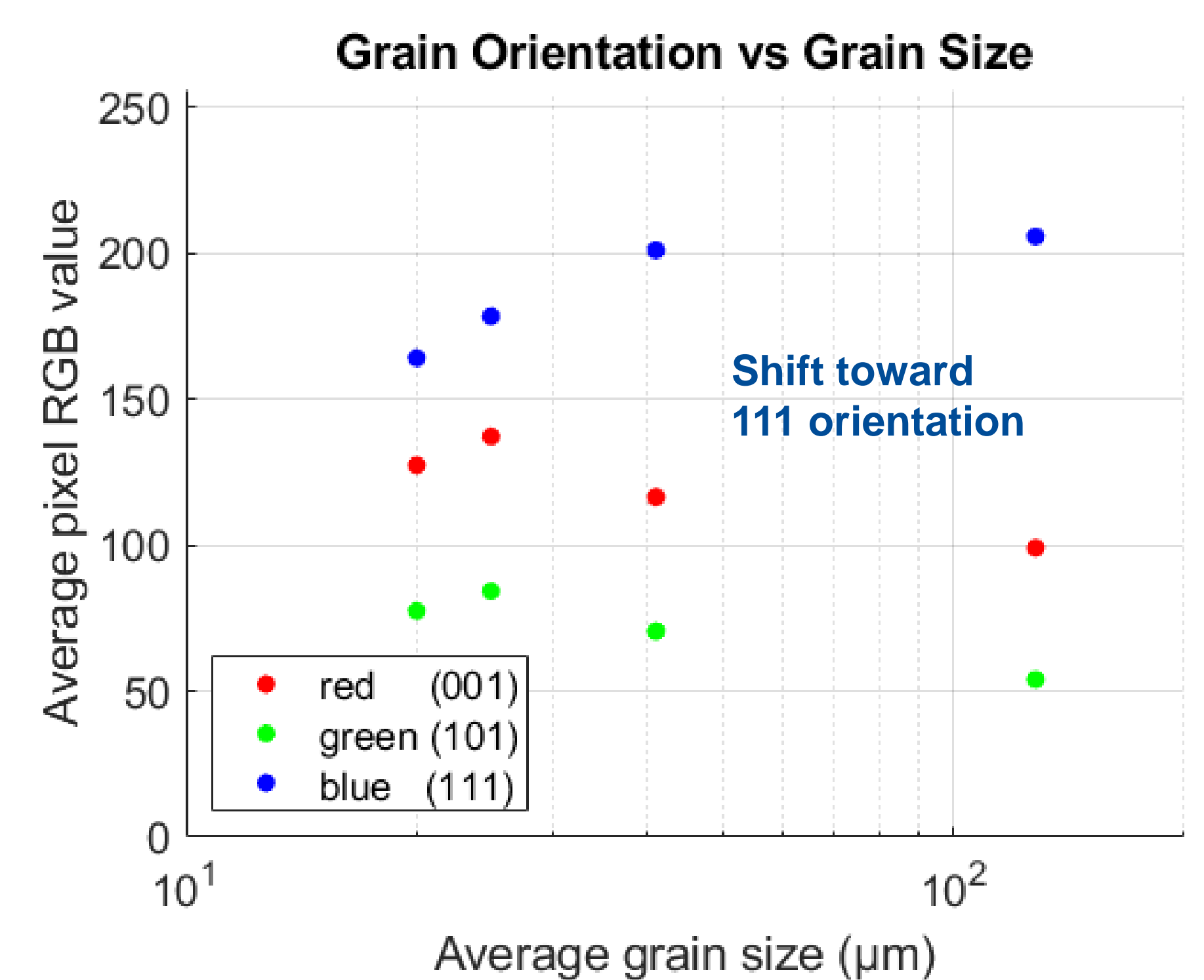
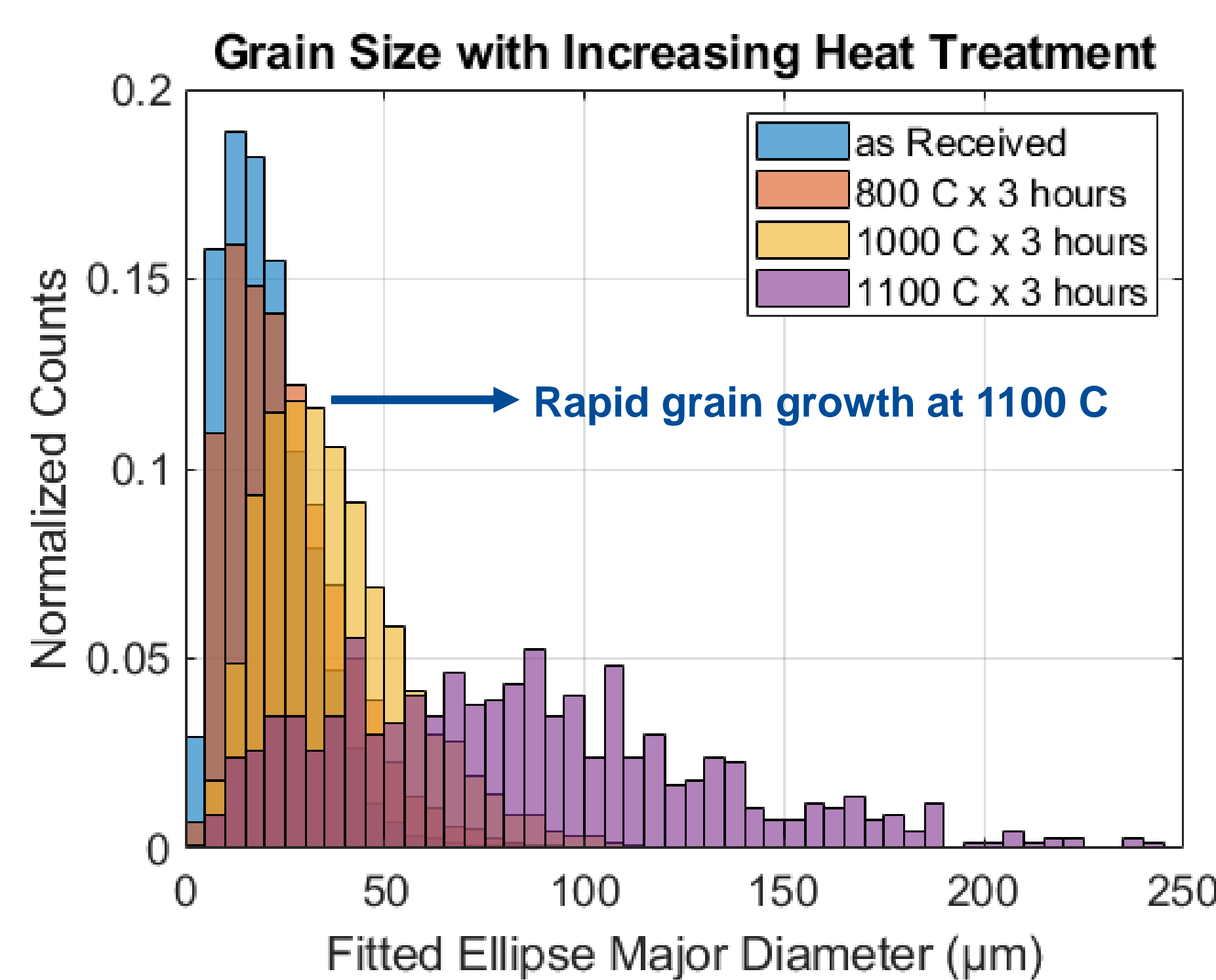
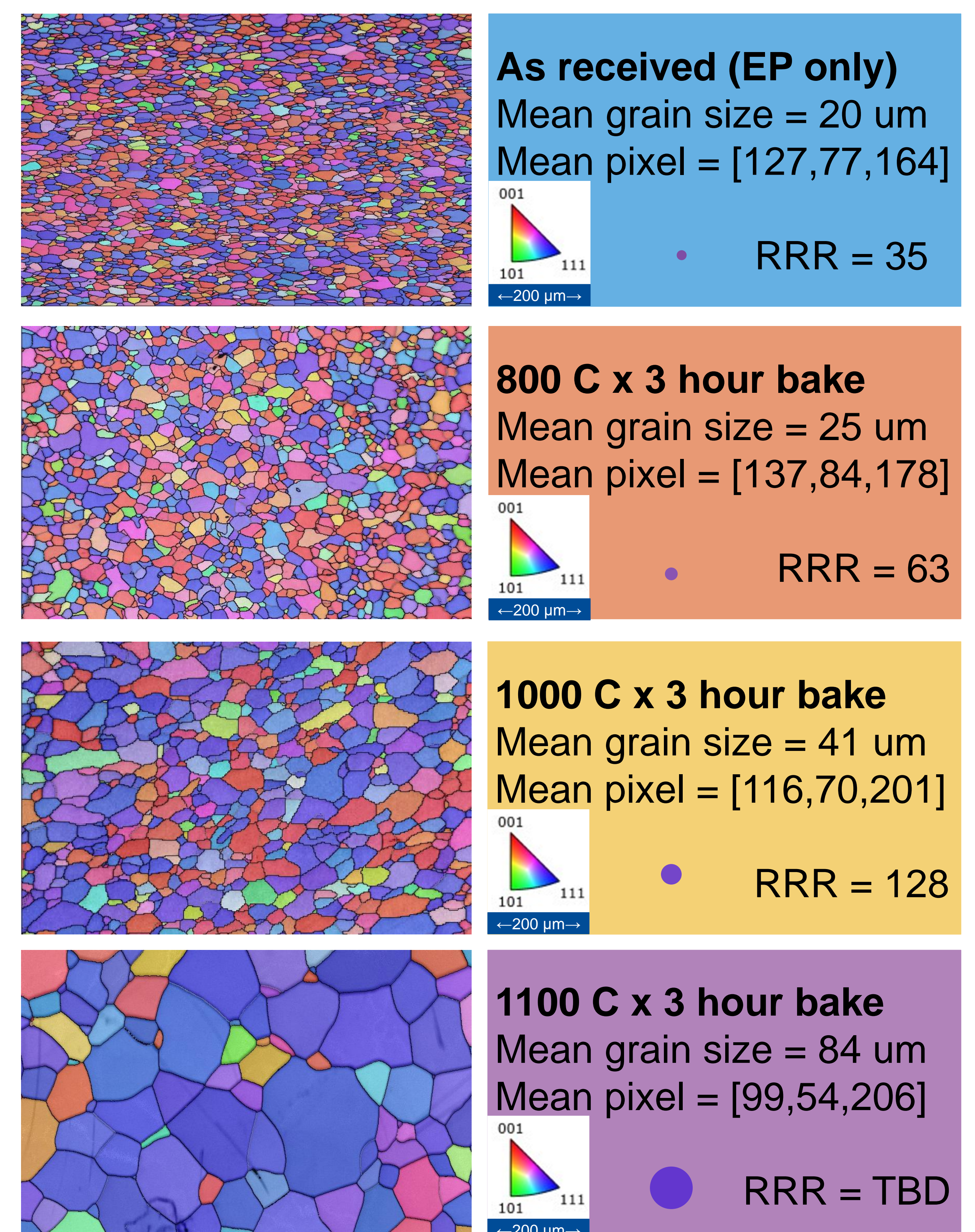
- Relationship between RRR, grain growth, and grain orientation
- Will provide input on vendor specifications for what material is acceptable for cavity application

## Impurity profiles

- RRR is a bulk property so we only care about bulk
- Impurities are **not** primary reason for low RRR



## Grain orientation maps and statistics



**Next:** measure RRR and flux expulsion at 1100 C (is it enough?)