

# Electron Microscopy Characterization of Microstructure in Zircad Prime Dental Ceramic

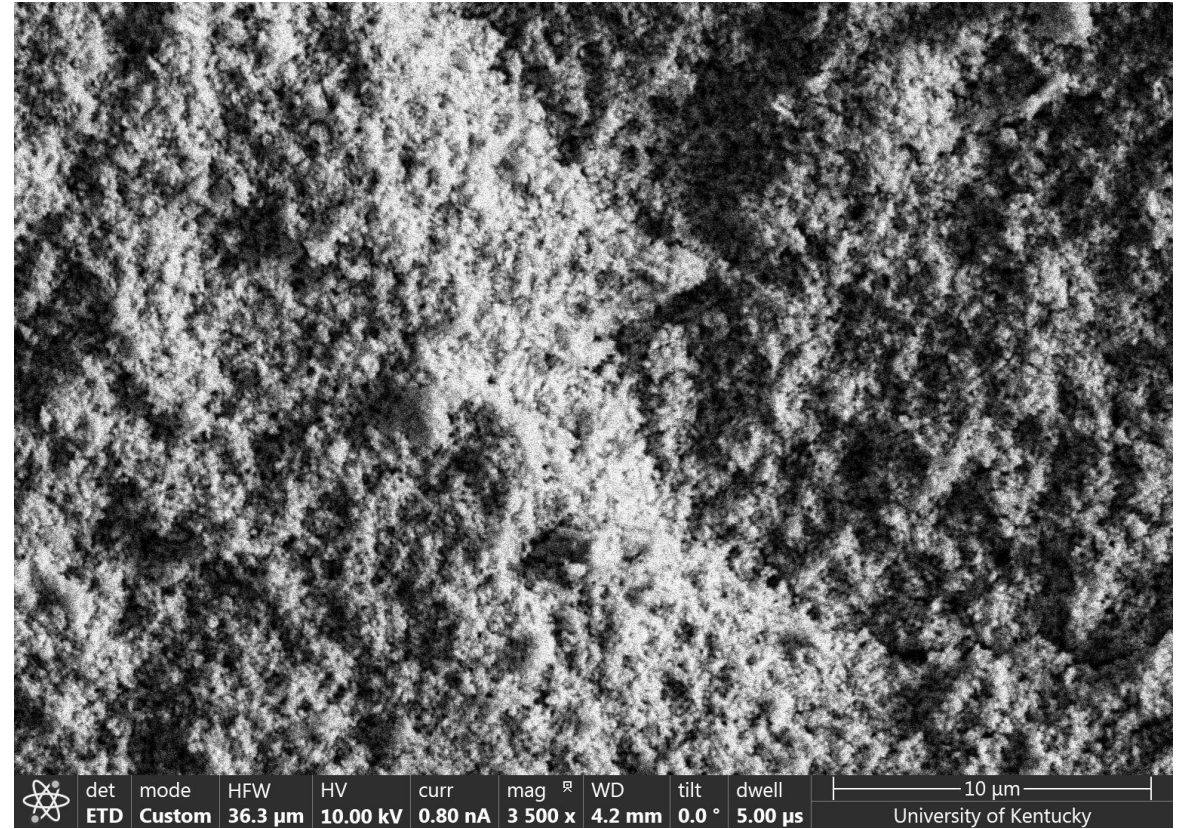
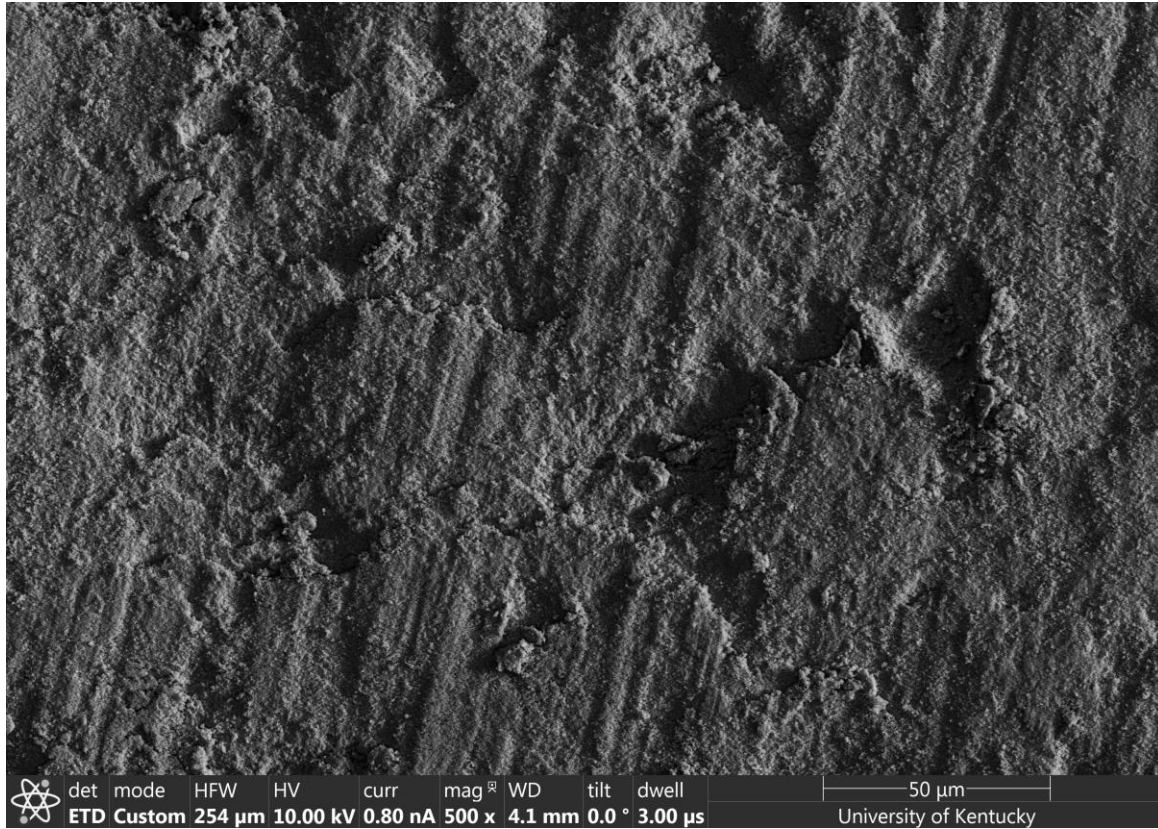
Avery Hartley

Assisted by Dr. Nicolas Briot

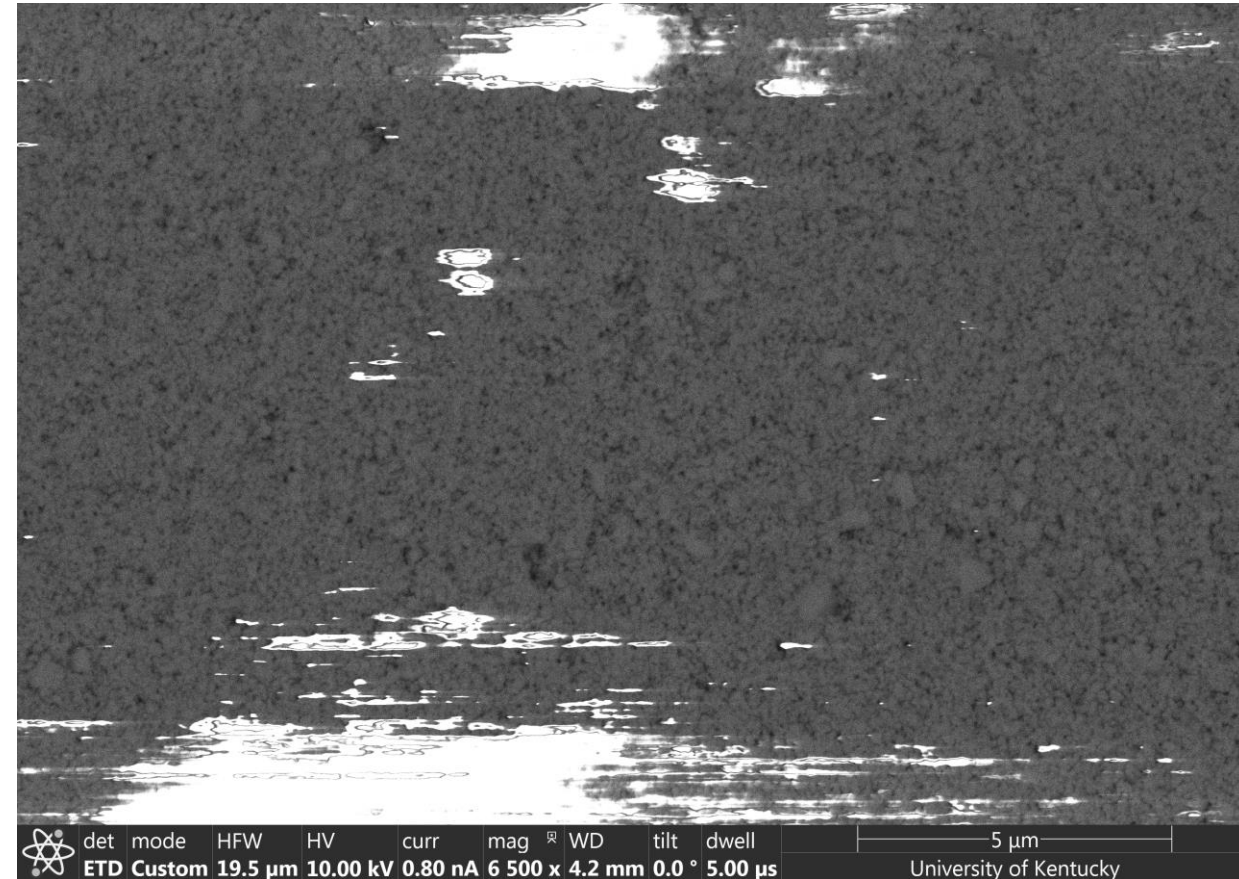
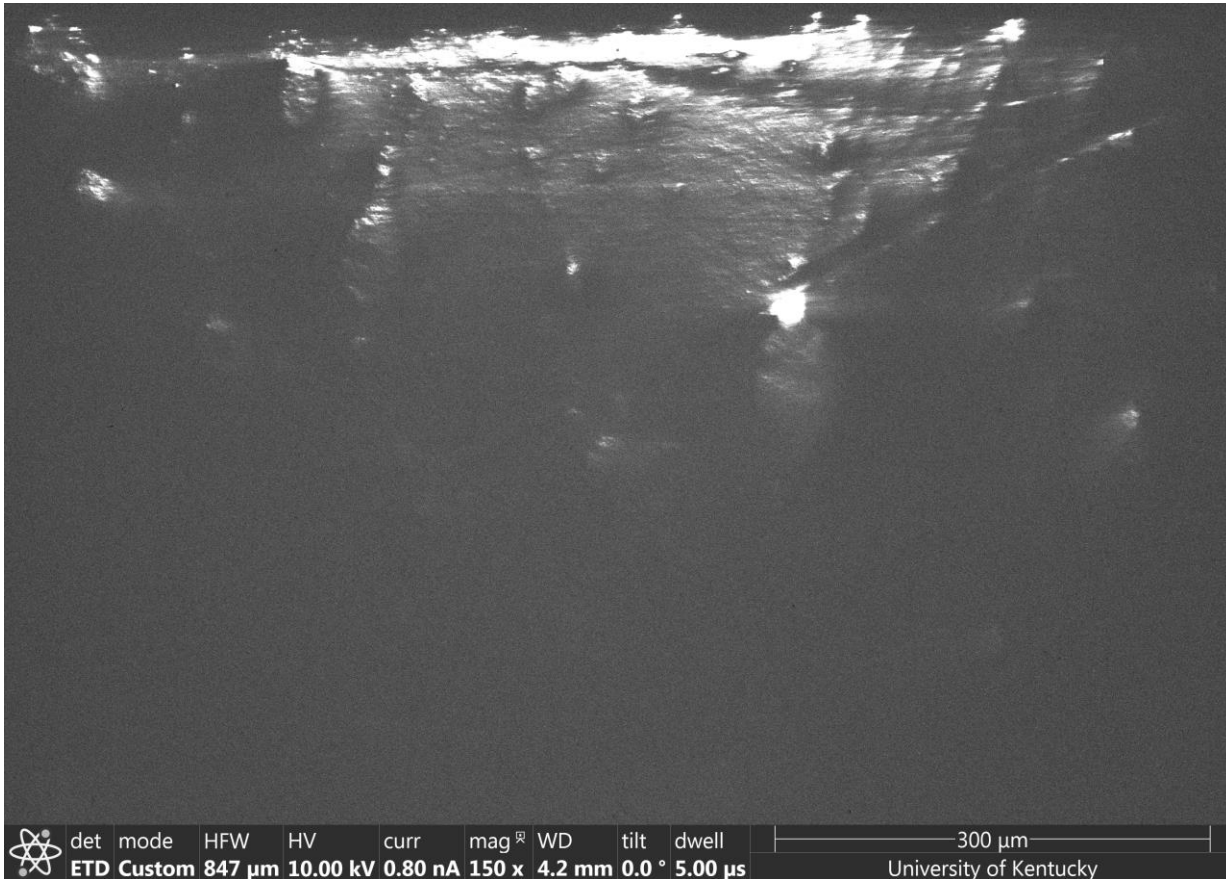
# Need for Investigation

- Alternating layers of zirconium and yttrium (EBS)
  - Alternating layers will have different mechanical properties and responses during grinding and polishing
- Surface morphology before and after sintering (porosity)
- Crystal structure (EDS)(FIB)
  - Mechanical properties related to orientation and yttrium dopant

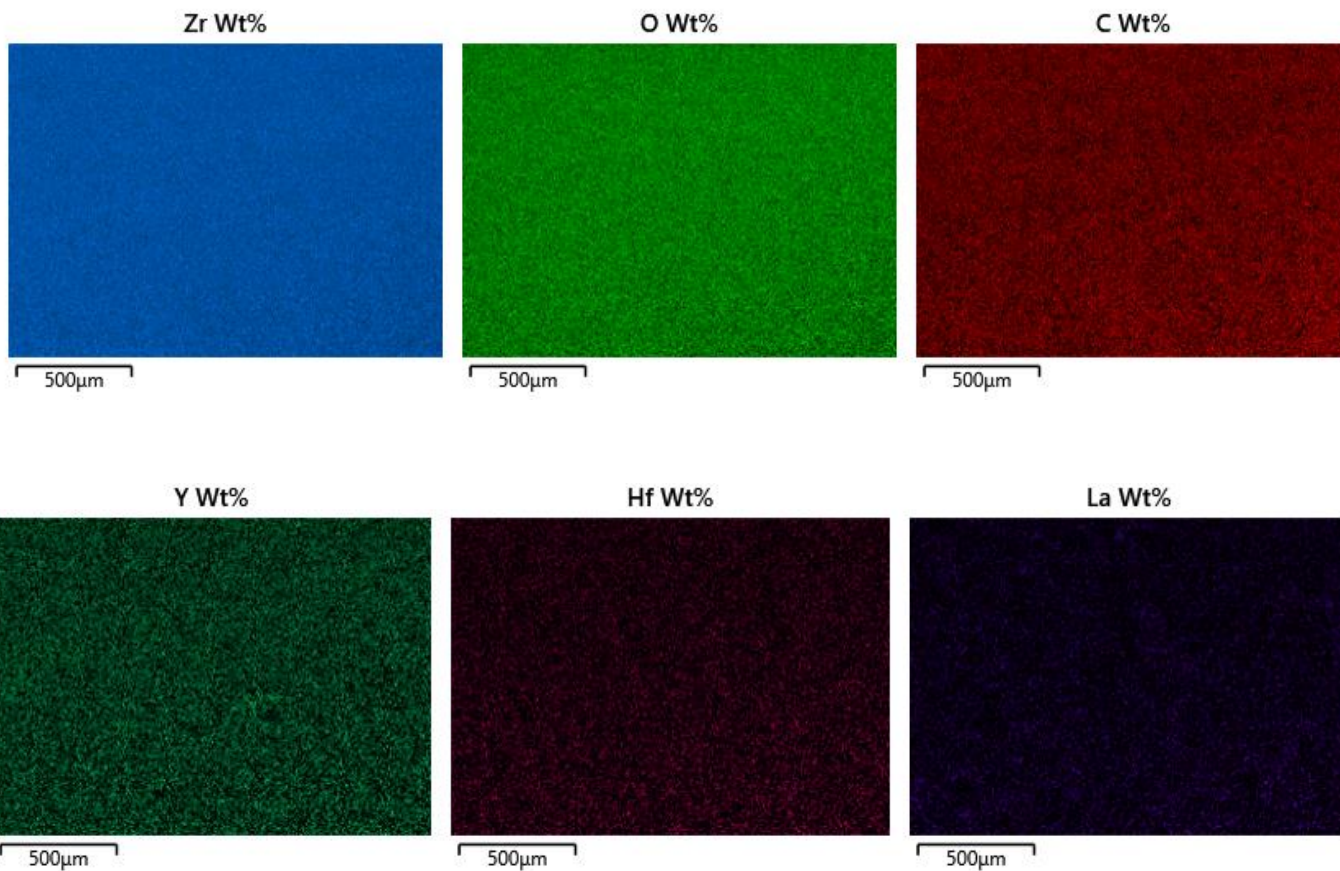
# Surface Image (Unsintered Unpolished)



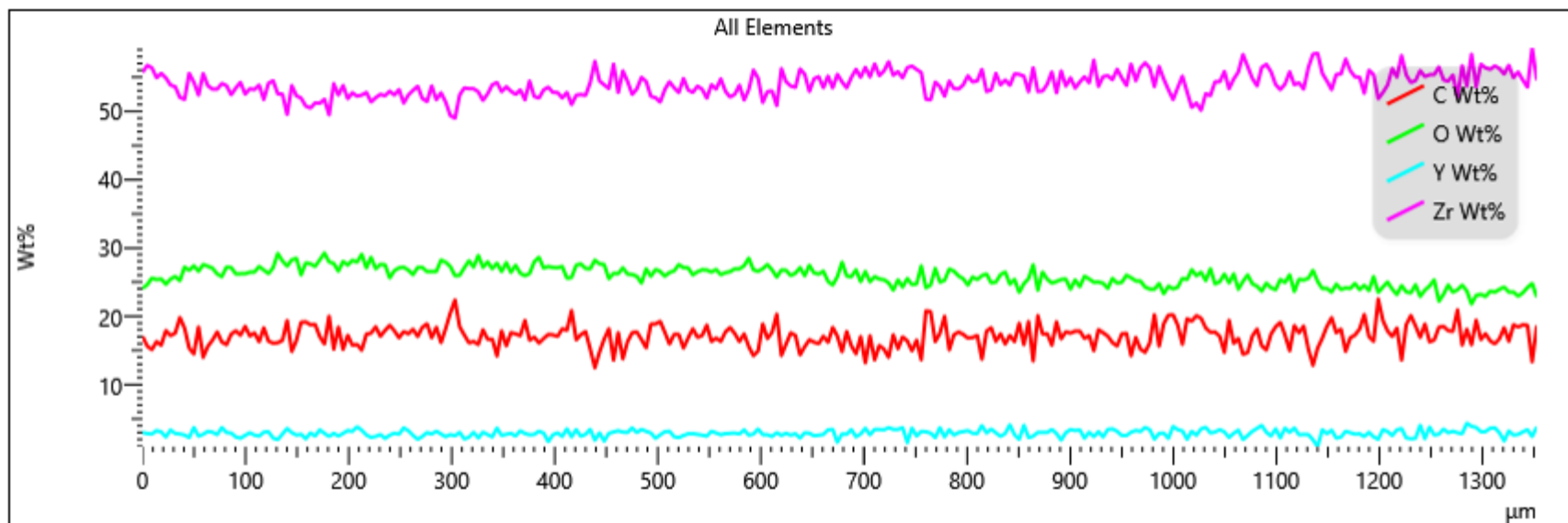
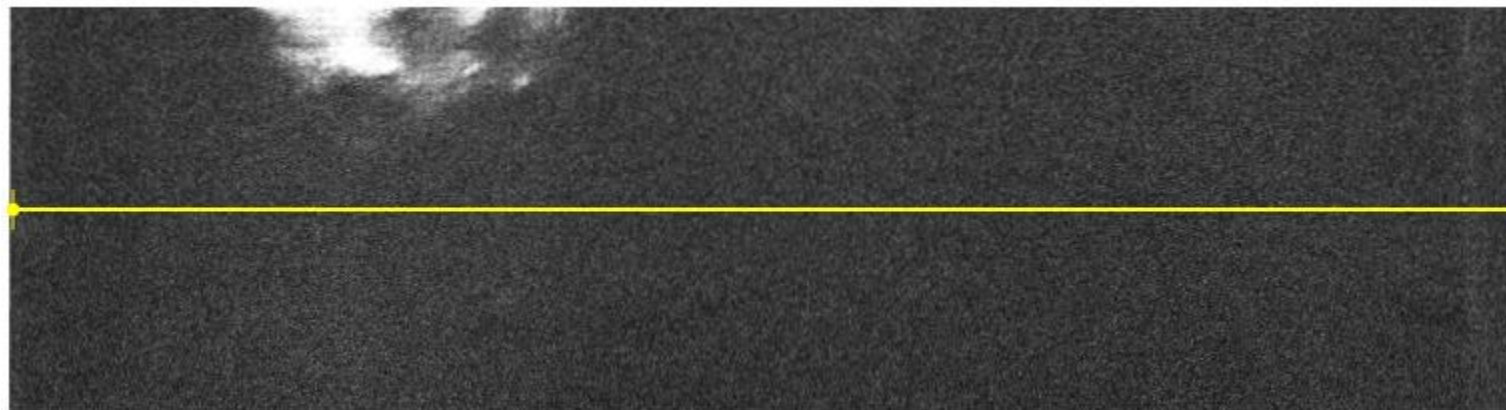
# Unsintered Sample (Polished; Graphite Puck)



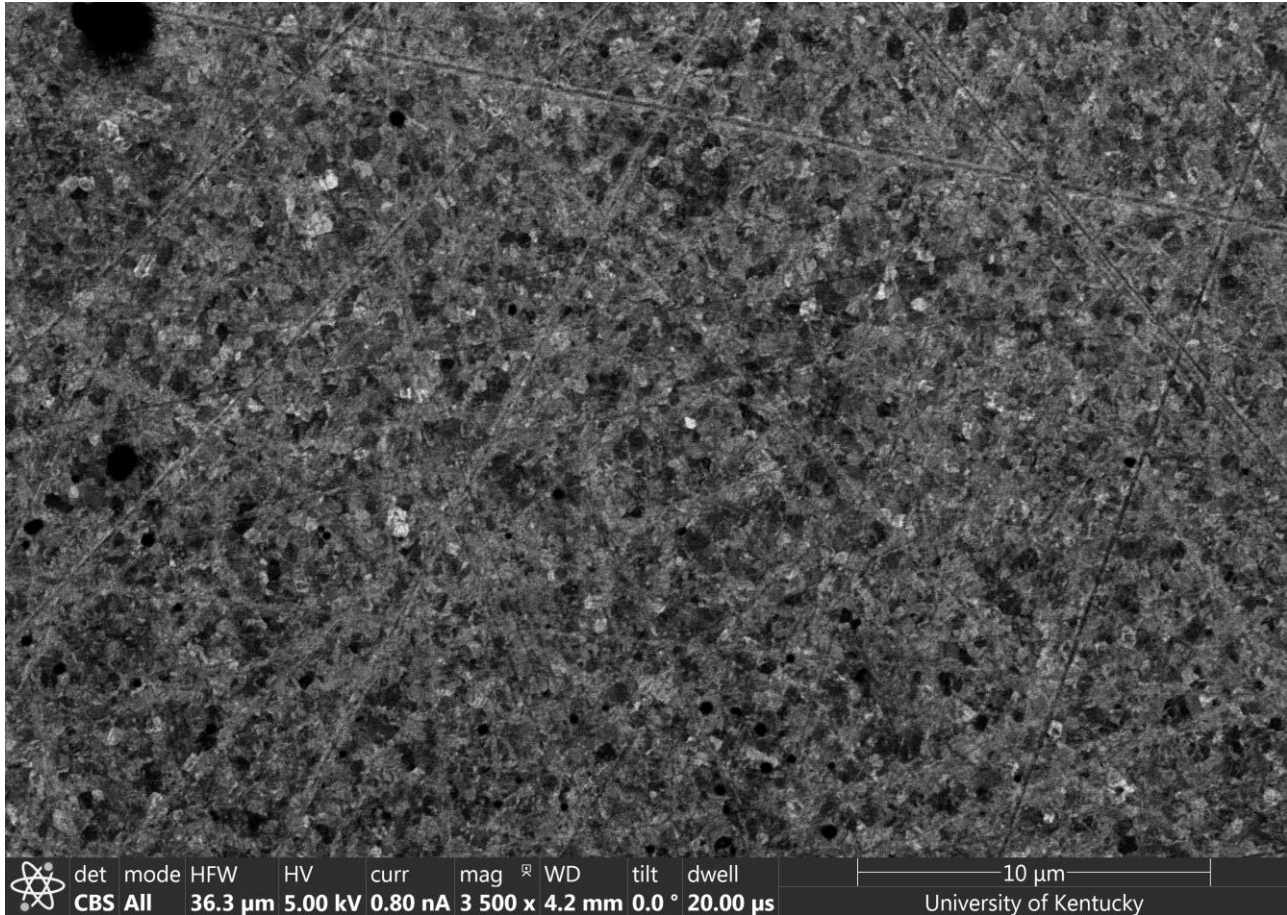
# EDS Results (Quant Map)



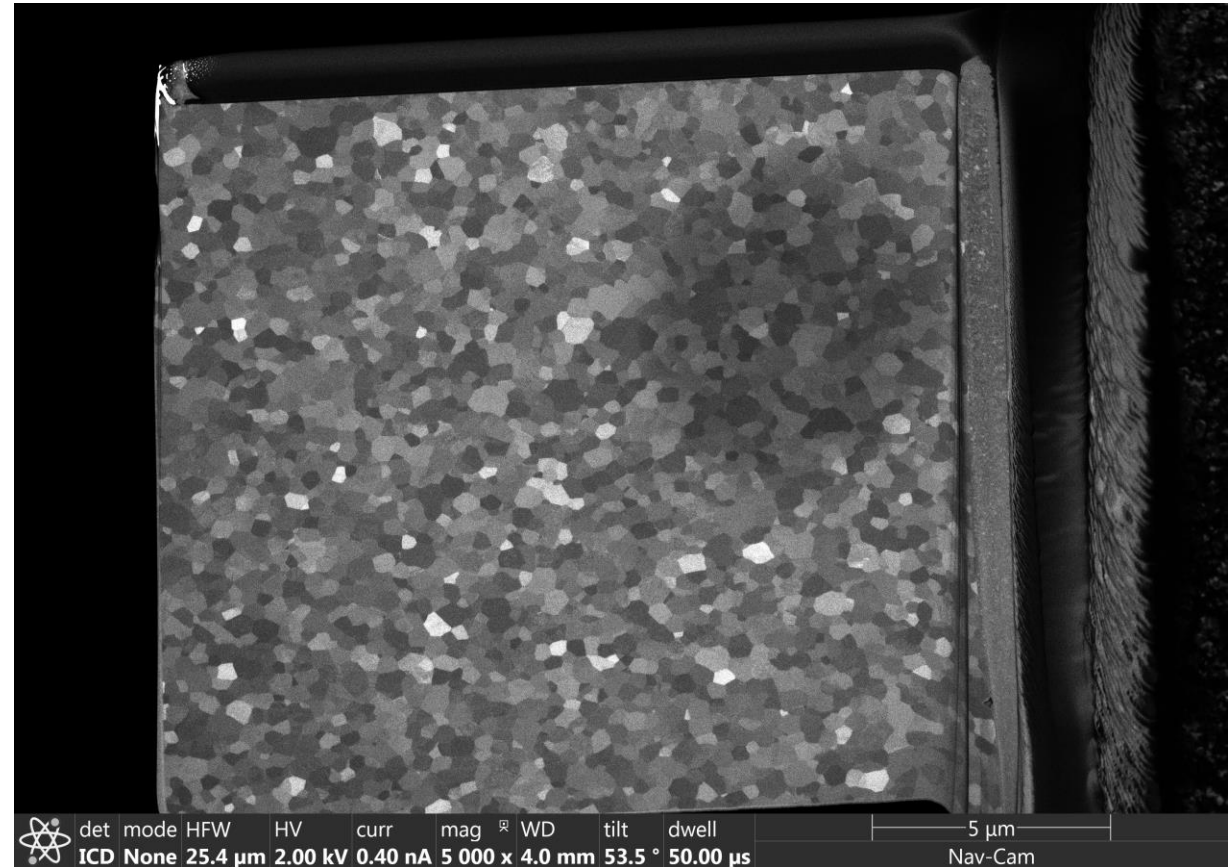
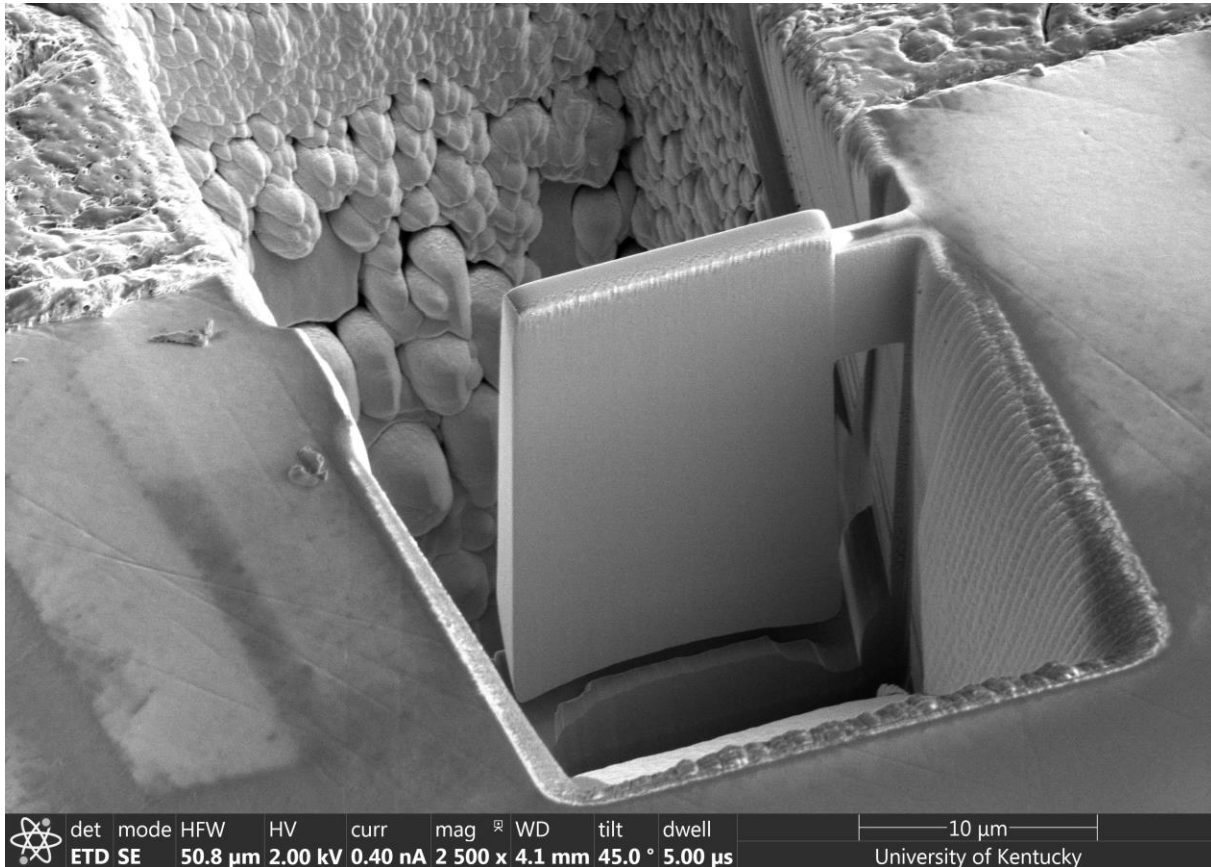
# EDS (Line Map)



# Surface Image (Sintered)



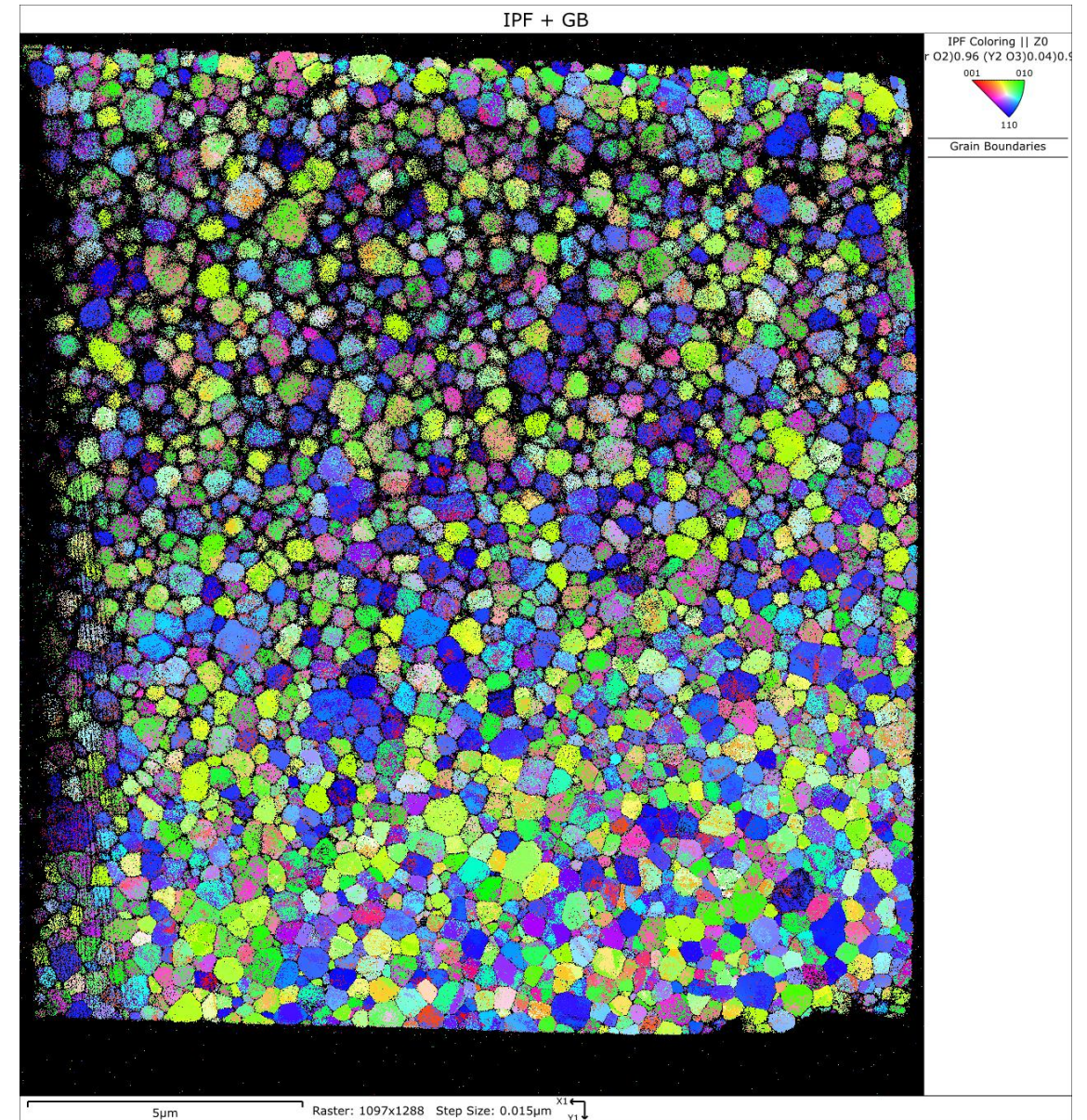
# Slicing and Grain Size





# EBSD Map and Analysis

- The initial sample had too small of grains for EBSD
- A small slice was taken so that transmission EBSD could be used
- Random orientation of grains
- Tetragonal phase (4 wt% yttria)
- Literature reports that with 4.5-6 wt% yttria dopant a 100% tetragonal composition is formed at room temp.



# Challenges

- Crack formation due to polishing
- Charging
- Consistency of powder density when sample was pressed
- Inconsistent polish after sintering due to variation sample composition