Microstructural Evolution of Sintering Ceramic Films

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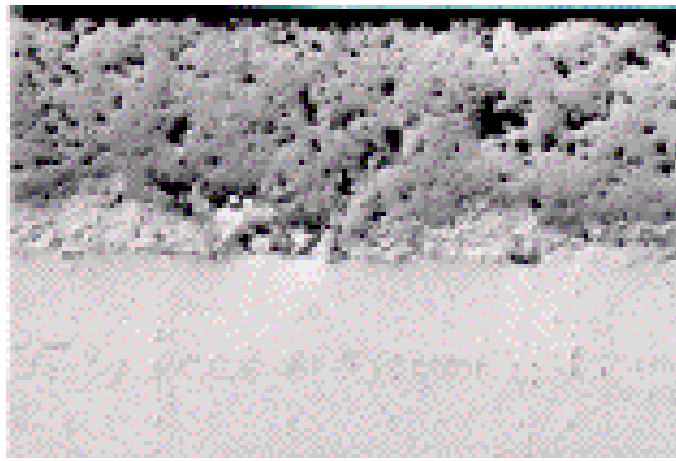
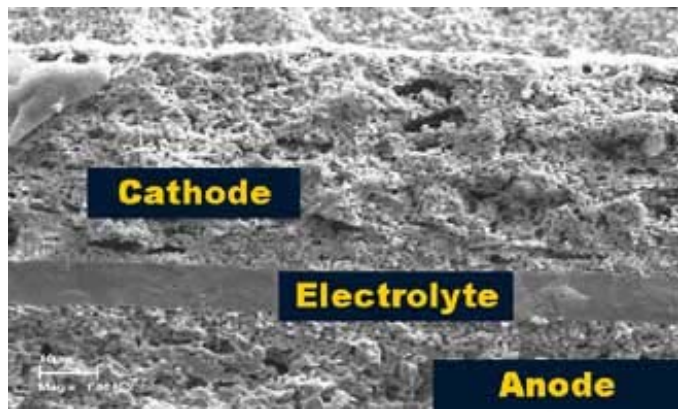


Goal: to understand the effect of an external force on the microstructure development of a sintering ceramic.

A better understanding will allow us to design ceramic materials with better properties (electronic, strength, etc.).



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Microstructural Evolution of Sintering Ceramic Films

Artificially introduce defects into green ceramics before sintering.
-Controlled sized pores
-Controlled sized cracks/holes

Make film (like clay)

↓

Introduce defects

↓

Stress film & Sinter at same time

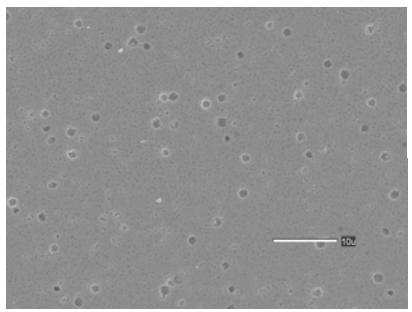
↓

Study microstructure development

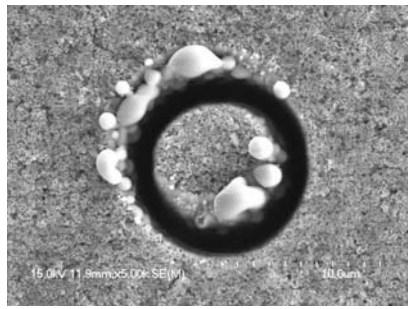
Polystyrene spheres introduced pore defects

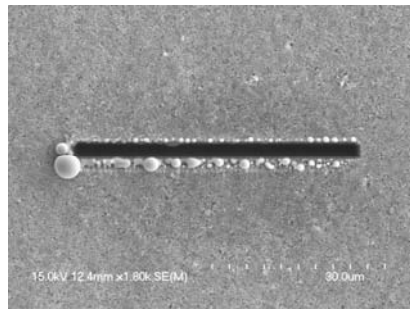
↓

Heating/Sintering

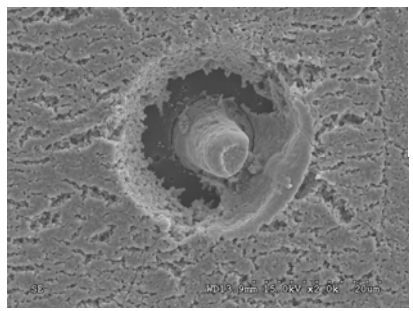


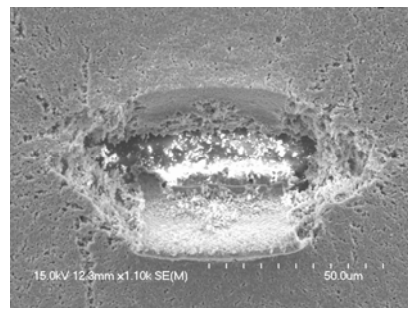
Focus Ion Beam (FIB) introduced defects





↓ *Heating/Sintering* ↓





(top and bottom not same scale)

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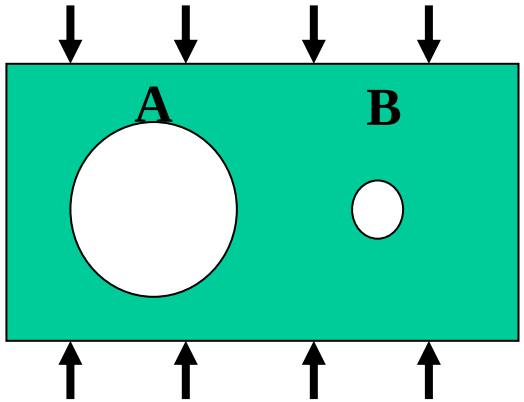
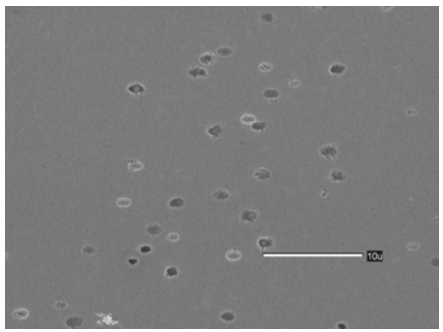
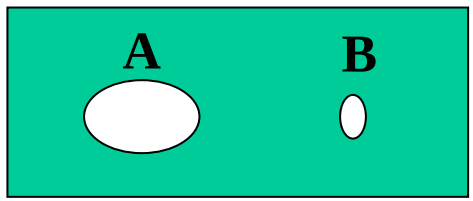
Microstructural Evolution of Sintering Ceramic Films

Pore Analysis Conclusions:
-Stressed ceramics develop anisotropic microstructures
-Transition point defines anisotropic behavior



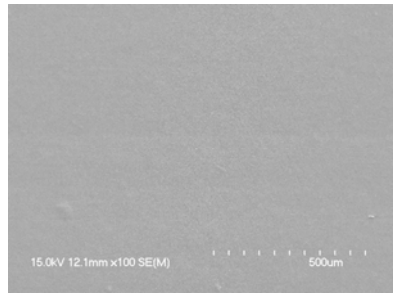
Before Sintering



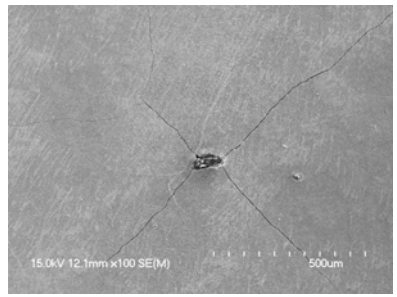


After Sintering

FIB Analysis Conclusions:
-Stress concentration has large effect on crack development and propagation
-Short-Long crack transition point determined



Without defect



With defect

- **New methods to study these complex systems have been developed.**
- **These methods have increase the understanding of microstructure behavior.**
- **This knowledge will increase the ability to design these materials with better electronic or strength properties.**

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