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Title:	Summer 2023 Internship Recap
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Summer 2023 Internship Recap

Carla Ann Navar

08/22/23

Experience Gained

1

BTO slurry

- Formulation
- Printing Iterations
- Examination

2

Acoustic NDE

- Alumina Green Parts
- Pure Copper

3

Fuel Cell

- Assembly
- Operation
- Inks

4

Flat Cell

- Assembly

5

Other

- CAD
- XRF mapping

6

Future Work

- BTO Slurry
- NDE

DLP Background

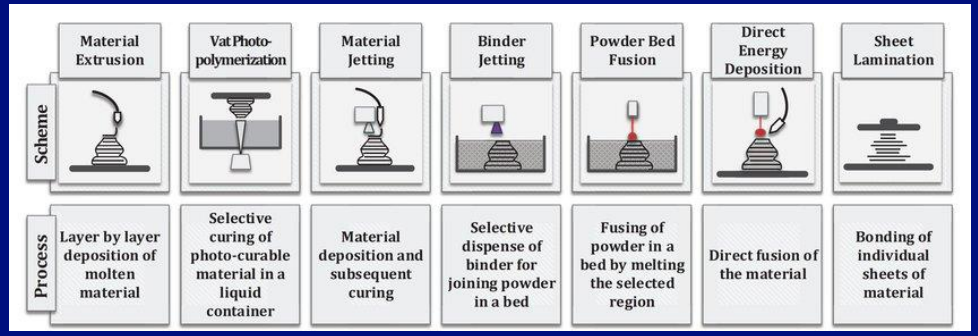
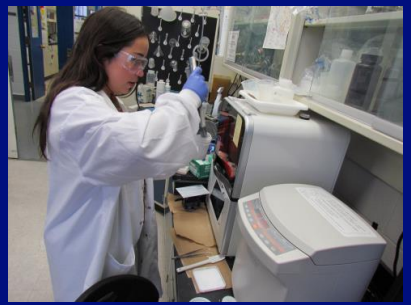


Diagram of types of Additive Manufacturing Processes



Conducting printing iterations

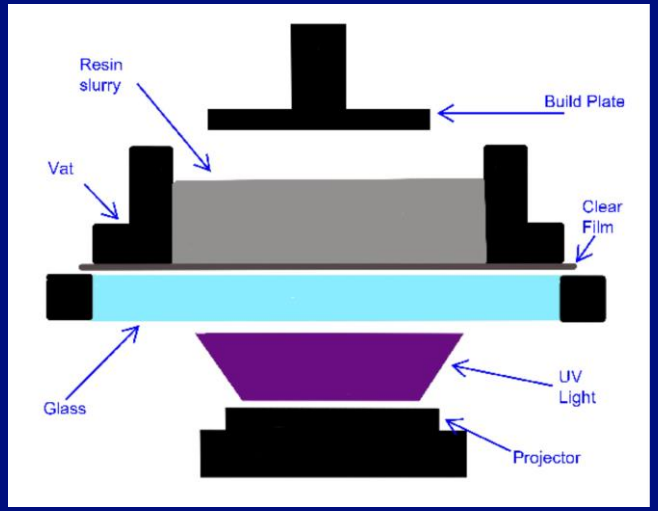


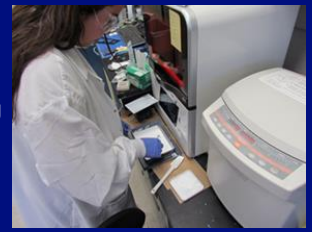
Diagram of DLP printing

(DLP- Digital Light Processing)

BTO Slurry

Project Background:

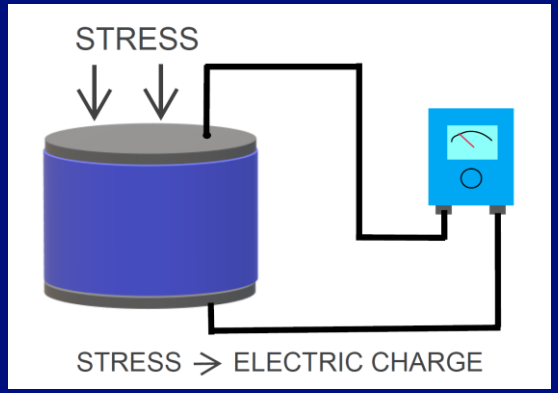
Achieving high loadings of BaTiO3 in ceramic slurries can lead to an increase in dielectric constant, high-permittivity and enhanced piezoelectric response.



Removing print from slurry

	70wt%								
	Genesis	BYK	BTO (100nm	BTO (400nm	Material	Container Weight	Total Mat Weight	Container+Mat	btowt%
g	62.72	4.48	58.24	98.56	224	64	224.000	288	
wt%	28.0	2.0	26.0	44.0					70

Formulation of 70 wt% BTO

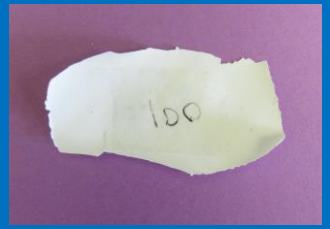


Piezoelectric effect

Images of 70 wt% BTO slurry

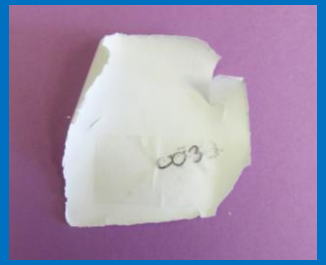
BTO Slurry Progress

Layer Analysis

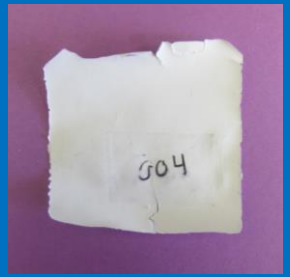


LI:190 IE:340 BE:190

LI:150 IE:320 BE:190



LI:130 IE:350 BE:190



LI:110 IE:350 BE:190

- Printing of 70 wt% BTO
- Parameterization of light Intensity and exposure time
- Unsuccessful adhesion to build plate

Validation Matrix

LI:200 IE:350 BE:205

LI:150 IE:320 BE:190

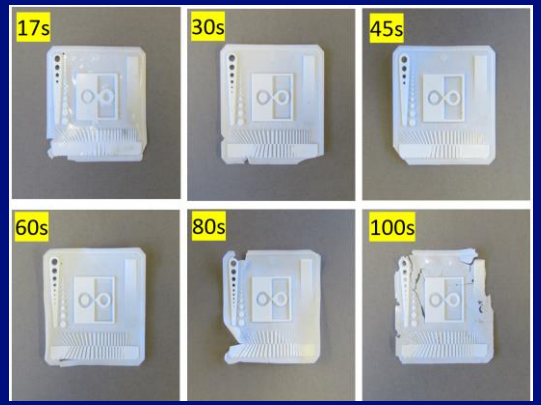
- A validation matrix is used to determine optimal print parameters based on resolution

Acoustic NDE- Alumina

- Formulation of 20% Al_2O_3 ceramic slurry mixture
- Printing iterations of validation matrices to determine adequate parameters for printing

$$Correlation(g,h) = \int_{-\infty}^{+\infty} g(\tau + t)h(\tau)d\tau$$

Time of flight found using cross correlation function



Validation Matrices printed at varying basic exposure times

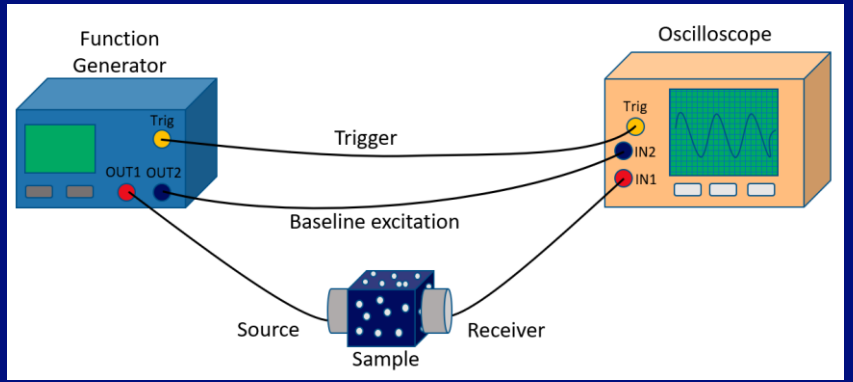
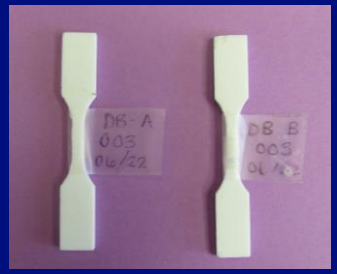


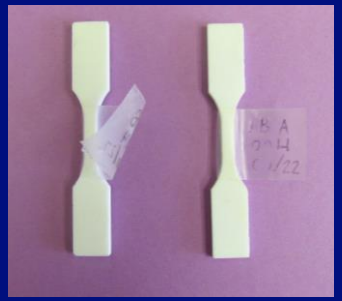
Diagram of Acoustic NDE Set-up

Acoustic NDE- Alumina

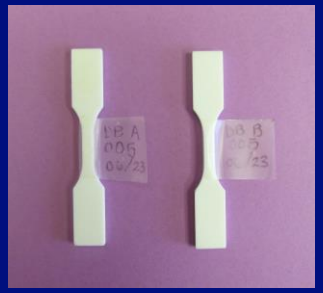
LI:120 IE:30 BE:17



LI:120 IE:30 BE:30

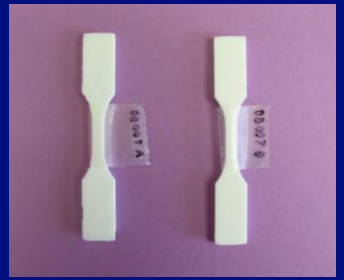


LI:120 IE:30 BE:45

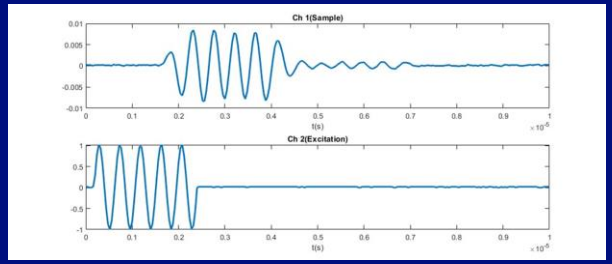


LI:120 IE:30 BE:65

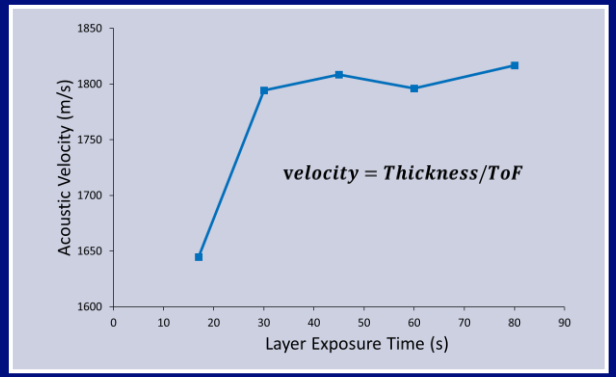
LI:120 IE:30 BE:80



LI:120 IE:30 BE:100



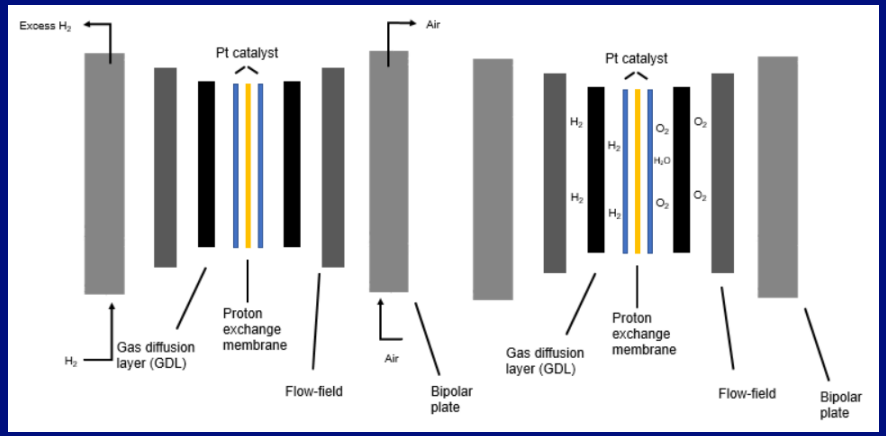
Signal through the sample compared with baseline signal



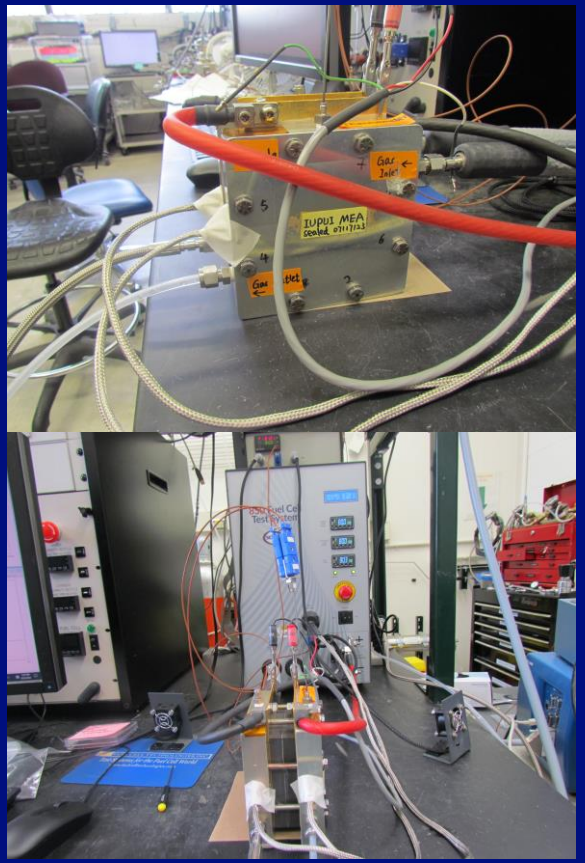
The acoustic velocity displays degree of polymerization

Fuel Cell

- Assembly and operation of PEM fuel cells
- Formulation of catalyst inks
- Manufacturing of electrodes



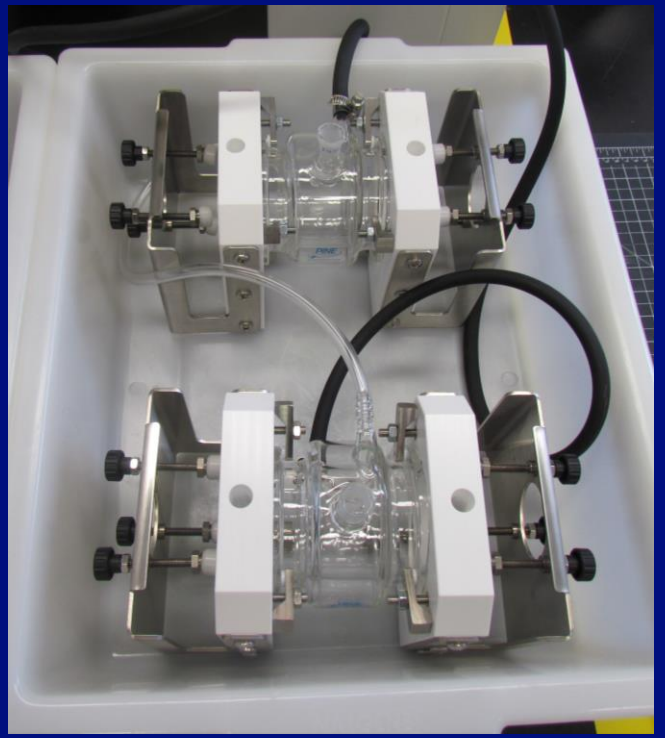
PEM Fuel Cell



PEM Fuel Cell

Flat Cell

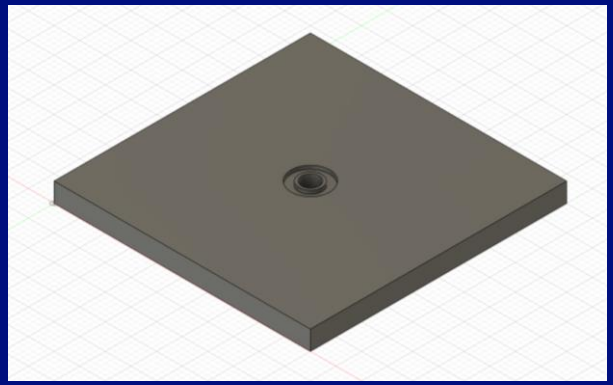
- Assembly and Set-up
- Corrosion on stainless steel



Flat Cells

Other

CAD



CAD of Flat cell end plate

XRF Mapping

Orbis PC used for X-Ray Fluorescence (XRF) Mapping

*XRF Mapping- Create visual representations of the elemental composition of a sample surface

Future Work

- Continue looking for correct printing parameters
- Possible NDE applications to evaluate material properties on BTO