Smart Piezoelectric Metamaterials for Partial Discharge Monitoring

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PROJECT AIMS & OBJECTIVES

- Design and manufacture a 3D printed piezoelectric sensor that provides acoustic emission information
- Evaluate the response of the new sensor(s) in laboratory partial discharge testing
- Compare this with existing acoustic and hybrid methods
- Report on the feasibility of using the new sensors to localize acoustic emissions from partial discharges in cables/cable connectors

Techniques

- 3D printed piezoelectric materials
- Microscanning laser Doppler vibrometer Micro-CT, (Look at the morphology)
- Investigated Sugar Casting Method
- Reflux Method/Centrifugation for functionalization
- Designed new Computer mould's models/ structures using 3D printing technology

RESULTS

- Review of sensor structure candidates
- Computer models/three-dimensional printing of piezoelectric materials
- Exponential relationship with exposure time in the range we printed
- 3D printing 45^0 And 85^0 struts model structures using Formlabs grey (Asiga)
- Test resulting mechanical displacement of the printed sample

Future Work

- Simulate the electromechanical properties of this new material using comsol
- Characterize the material using FTIR, Raman and X-ray diffraction (XRD) techniques
- Investigate further the acoustic response of this new composite material
- Computer modelling
- Experimentation to develop a proof-of-principle sensor
- Evaluation in terms of the sensitivity and signal to noise ratio in laboratory settings

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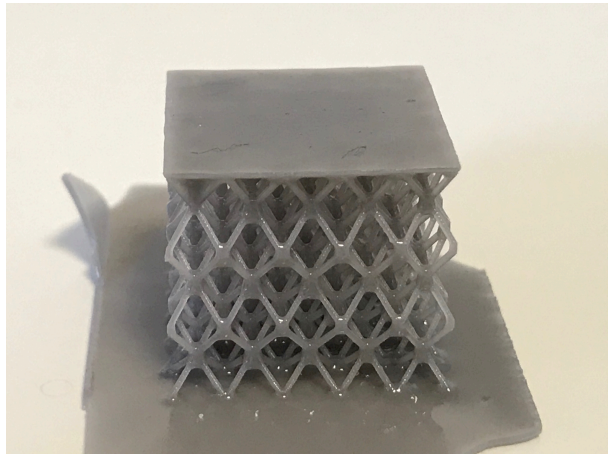
A



B

Fig (A & B) printed 45 and 85 degree angle strut model structures using formlabs grey plus PZT. Scale 1mm