

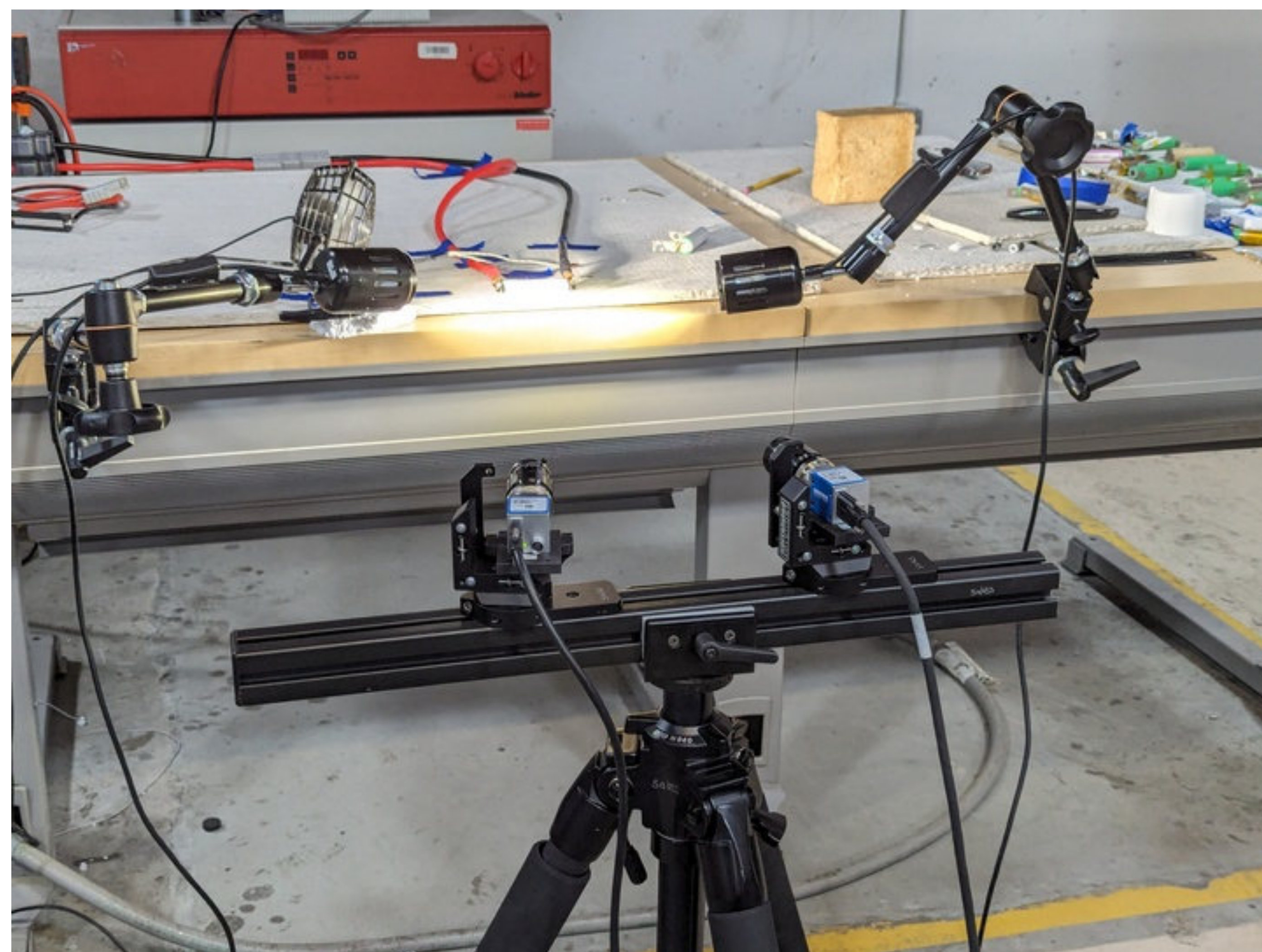
Battery Expansion Measured with Digital Image Correlation

John White, Connor Madden, George Anthony

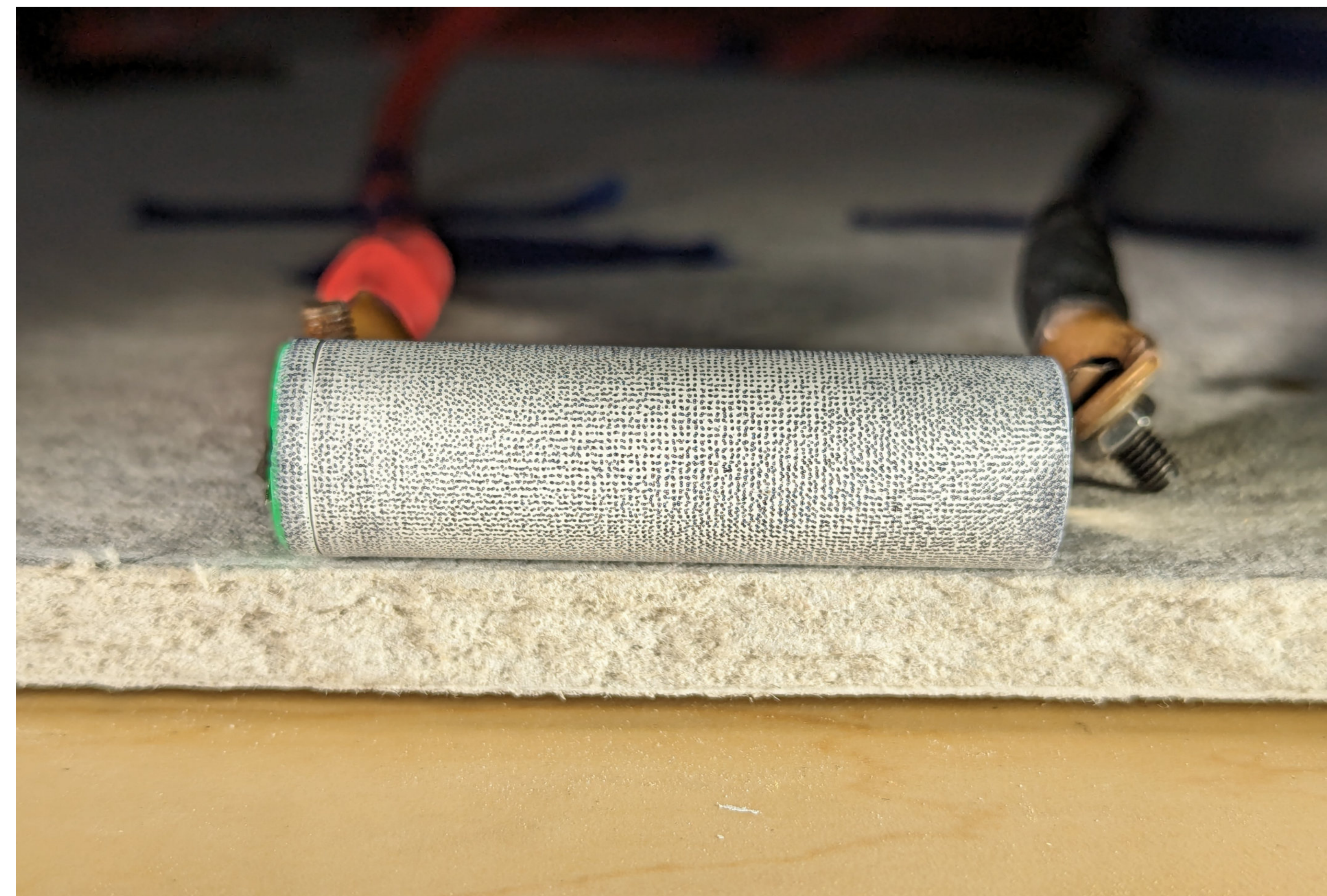
University of South Carolina, Professor Austin Downey

Overview

- Digital Image Correlation (DIC) is a non contacting measurement method that produces full field strain and deformation readings.
- This test was performed using a 3D DIC system to monitor strain on a battery while it was discharged at high current causing the battery to heat up and expand.
- At a certain point the pressure inside the battery will cause the Current Interrupt Device (CID) to activate preventing the battery from combusting but also making it unusable.
- Understanding the limits of these batteries will allow them to be used to their full capacity.



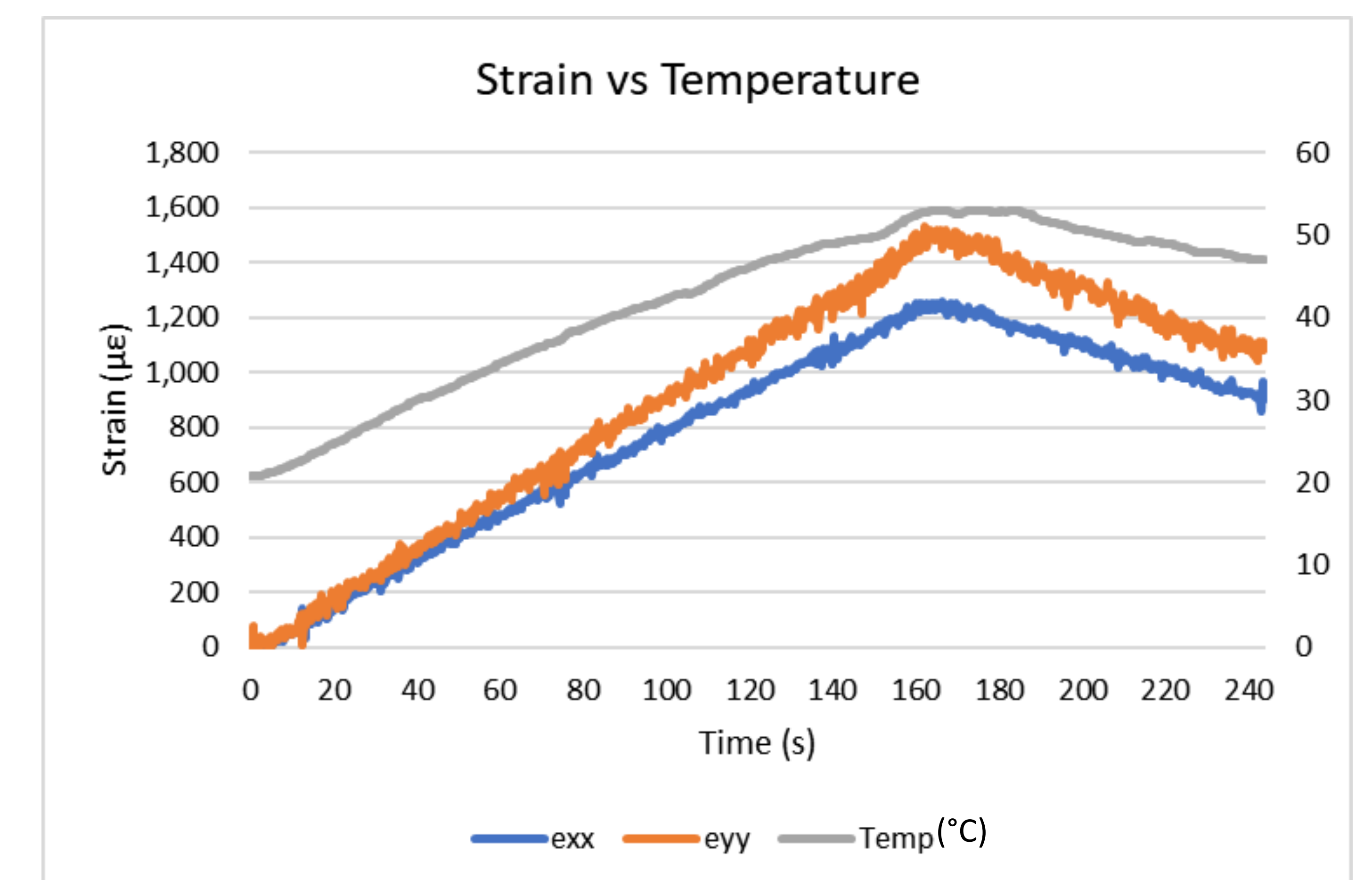
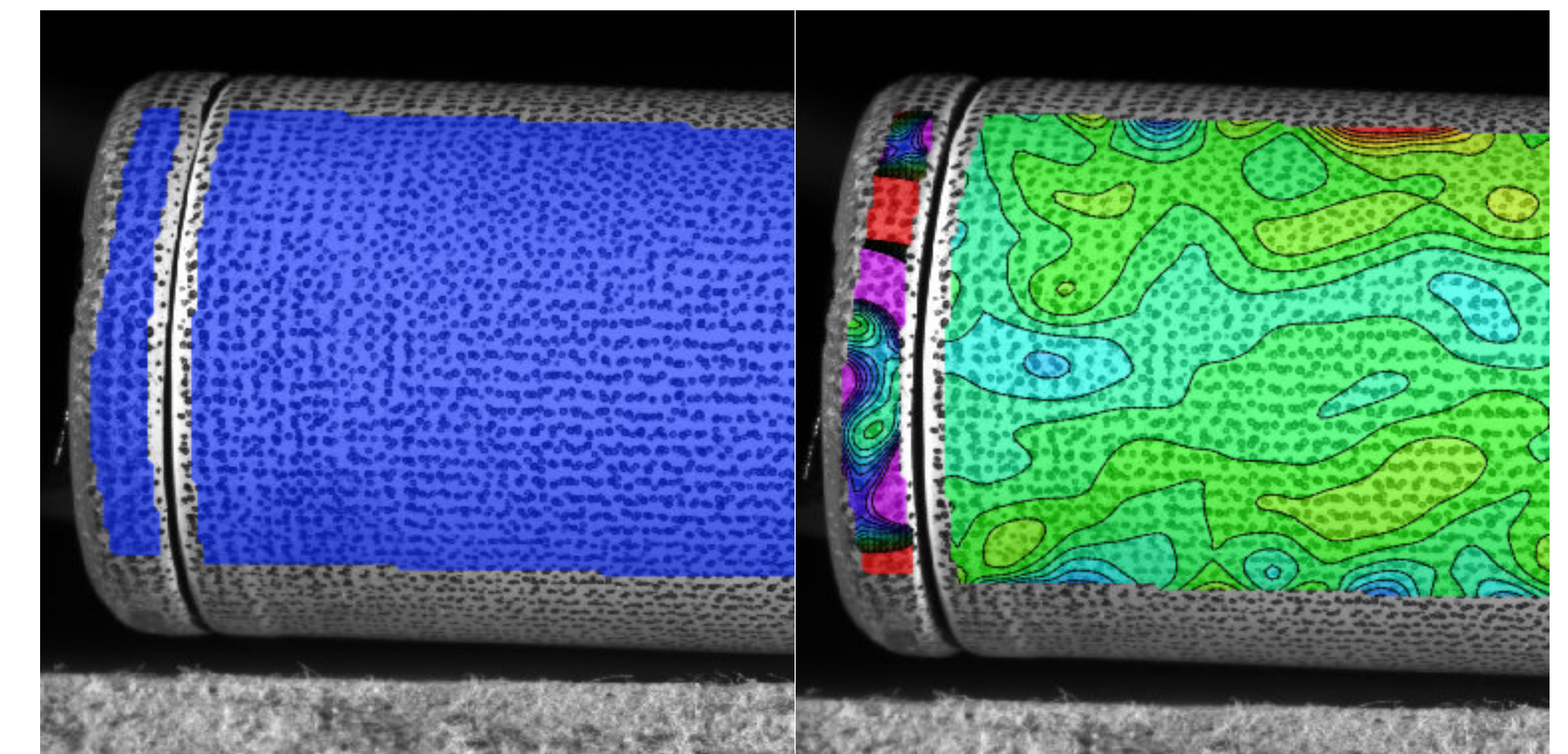
Setup



- For a 3D DIC system two cameras are mounted in stereo to capture images while the battery was discharged.
- Two 5 megapixel cameras with 50mm lenses were used along with polarizing filters on the lights and lenses to reduce glare.
- A speckle pattern was applied to the battery using a stamp.
- The temperature of the battery was recorded as well using a thermocouple.

Results

- The battery reached a maximum stress of about 1500 micro strain and a maximum temperature of around 55° C.
- The Eyy data is shown below at 0 seconds and 160 seconds. The stress is greatest at the CID.



correlated
SOLUTIONS

UNIVERSITY OF
South Carolina

This work is partially supported by the National Science Foundation (NSF) grant number 2237696. This work is also partially supported by the Air Force Office of Scientific Research (AFOSR) through award number FA9550-21-1-0083. The support of these agencies is gratefully acknowledged. Any opinions, findings, conclusions, or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation or the United States Air Force.