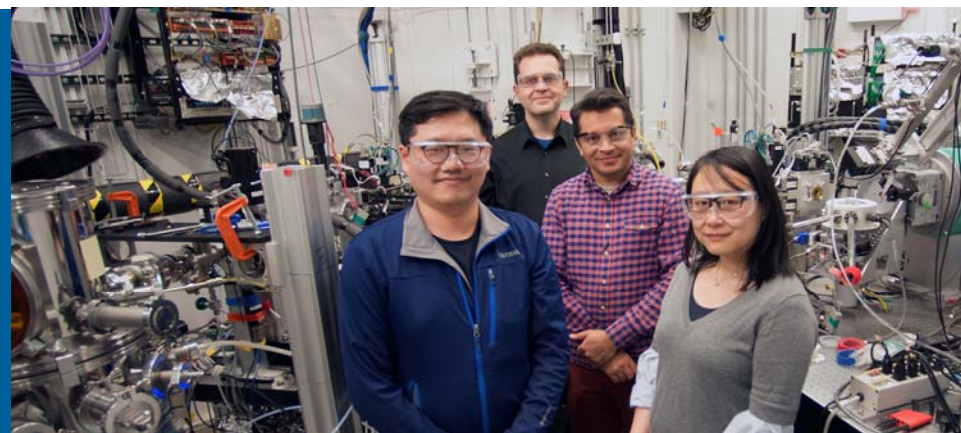# 8-ID-E LIGHT SOAKING, THERMAL CONTROL AND IN SITU FUNCTIONAL STUDIES

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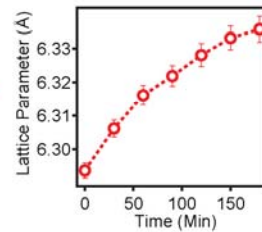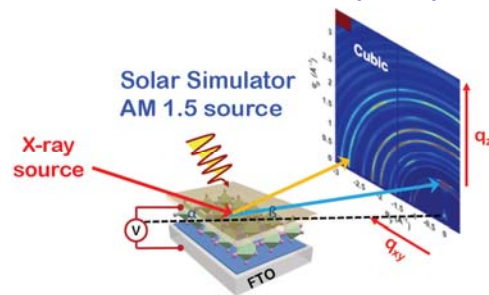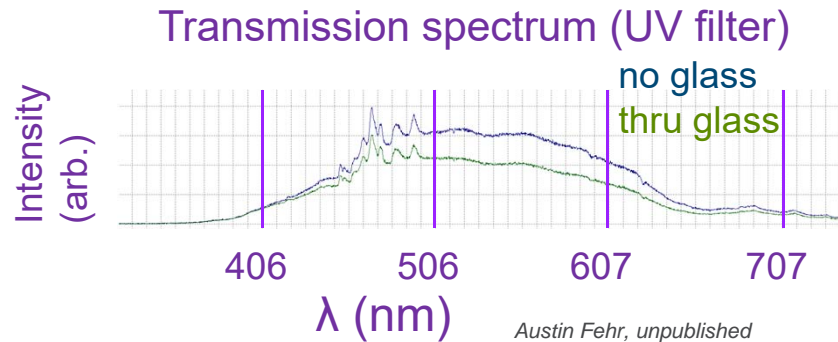**KEVIN PETERSON, MAX WYMAN**
XSD-BCDA

LIGHT SOAKING
Solar simulator Oriel LCS 100 (not included)

- Viewport transmits Vis range

Transmission spectrum (UV filter)

no glass
thru glass

Intensity (arb.)

406   506   607   707

λ (nm)

Austin Fehr, unpublished

Solar Simulator
AM 1.5 source

X-ray source

Cubic

q_z

q_{xy}

FTO

Lattice Parameter (Å)

6.33
6.32
6.31
6.30

0   50   100   150
Time (Min)

Before Light   After Light

J (mA/cm²)

20
10
0
-10
-20

0 min
Dark — Light
120 min
Dark — Light

0.0   0.4   0.8
Voltage (V)

Tsai *et al.*, *Science* **360**, 67 (2018)

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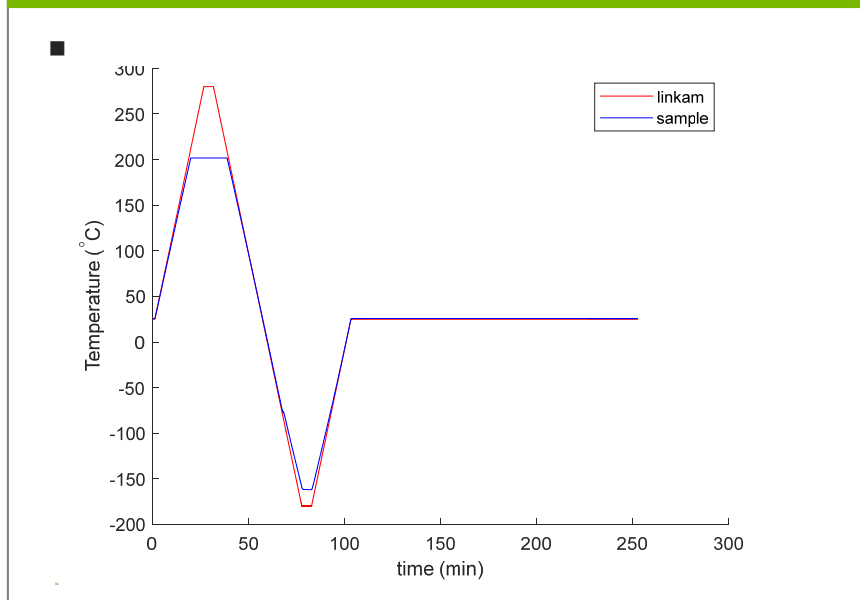# THERMAL CONTROL -185°C < T < 300°C

Linkam HFS350X-GI

- Thermal element surface flush with box
- Liquid N2 pump for cooling/T-control
- Operate only in vacuum or dry gas
- T-96 controller (USB)
- EPICS-integrated (Kevin Peterson)
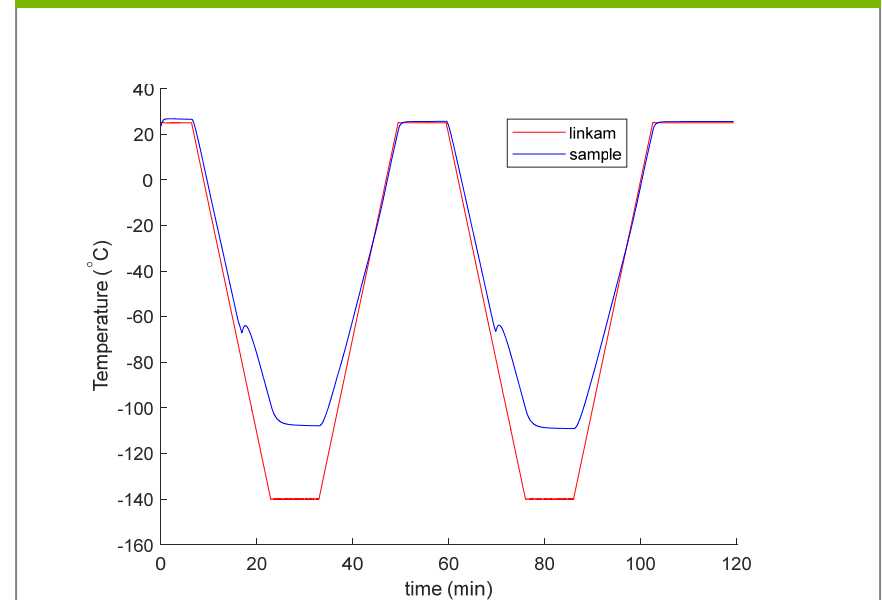- Windows-based IOC
- Heat/cool 30°C/min
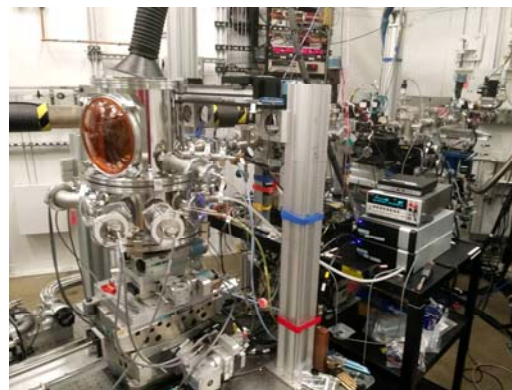
THERMAL CONTROL RESULTS
Pt-111 epoxied to test sample, readout Lakeshore 340 (in vacuum)

SILICON SUBSTRATE

GLASS SUBSTRATE

THERMAL CONTROL ALTERNATIVE

Anton Paar DCS series

- Domed sample chamber (graphite)

- LN2 cooled

- -180°C < T < 500°C

- Other temperature ranges available

- Higher price, but dome is the vacuum chamber

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ELECTRICAL MEASUREMENTS

## Linkam stage supports electrical connection, Lemo-style feedthru

- Keithley 2400 Sourcemeter

- Voltage < 200 V

- EPICS-integrated with waveform support (Max Wyman)

- Python code to implement linear staircase sweep

- https://8id.xray.aps.anl.gov/elog/8-ID/494 B.3.f

- Point contact probes needed!

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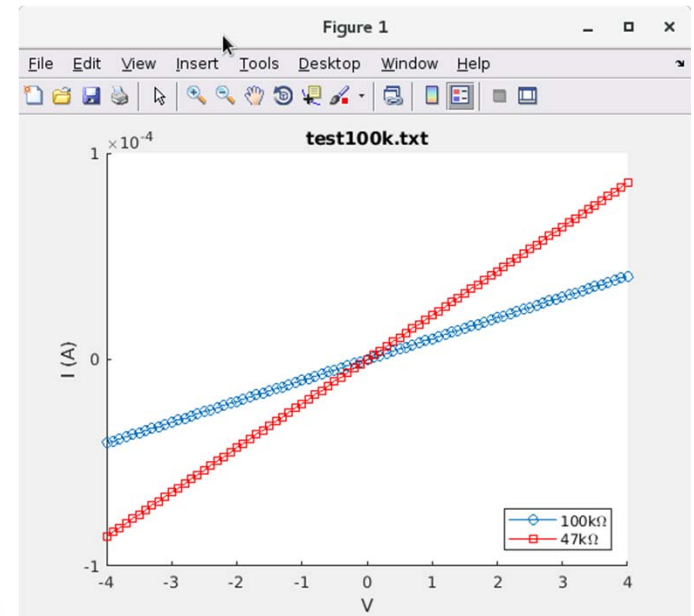
ELECTRICAL MEASUREMENTS

Application: Perovskite thin films as x-ray detectors

- Measure x-ray induced current in perovskite-based p-i-n diode

- Candidate material for x-ray detectors
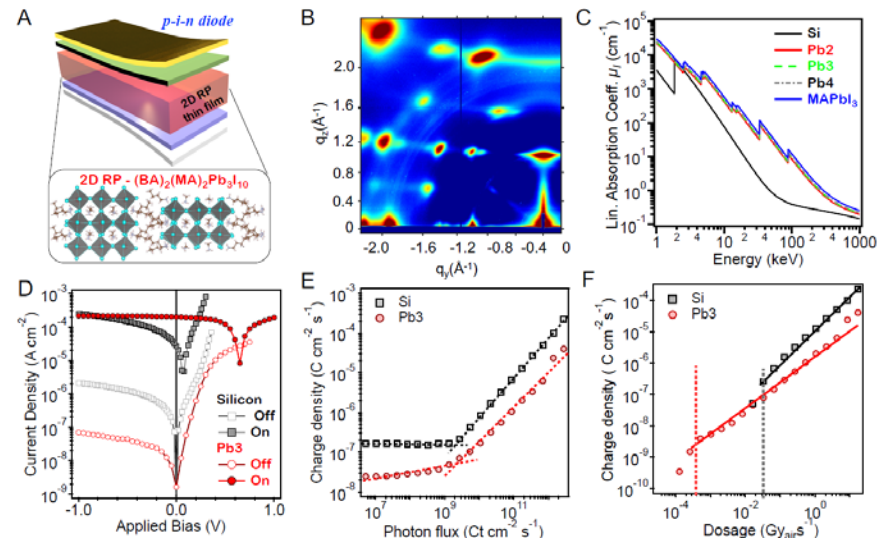
Tsai, Liu, Shreshta, Fernando, Tretiak, Scott, Vo, Strzalka and Nie, *Science Advances*, *in press* (2020)

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