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X-RAY SCIENCE DIVISION

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ARGONNE NATIONAL LABORATORY

CREATE SCIENCE-BASED METHODS TO ACCELERATE THE PROGRESSION OF FUTURE TECHNOLOGIES AND MATERIALS FROM DISCOVERY TO DEMONSTRATION

CORE FACILITIES

DISCOVERY SCIENCE

USE INSPIRED SCIENCE



ADVANCED PHOTON SOURCE



CENTER FOR NANOSCALE MATERIALS



ARGONNE LEADERSHIP COMPUTING FACILITY



SCALABLE SYNTHESIS AND PROCESSES



DIGITAL AND SMART MANUFACTURING TECHNOLOGIES



MULTISCALE SCIENCE AND PREDICTIVE SIMULATION TOOLS



METAL ADDITIVE MANUFACTURING

- ✓ Extreme complexity
- ✓ Highly customized
- ✓ On-site and on-demand
- ✓ Multi-material component

- Energy and materials saving
- Mechanical strength
- Unique microstructures
- Overall cost

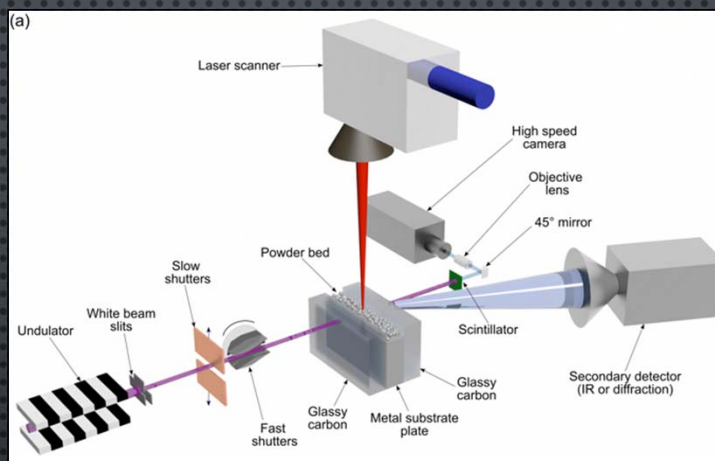
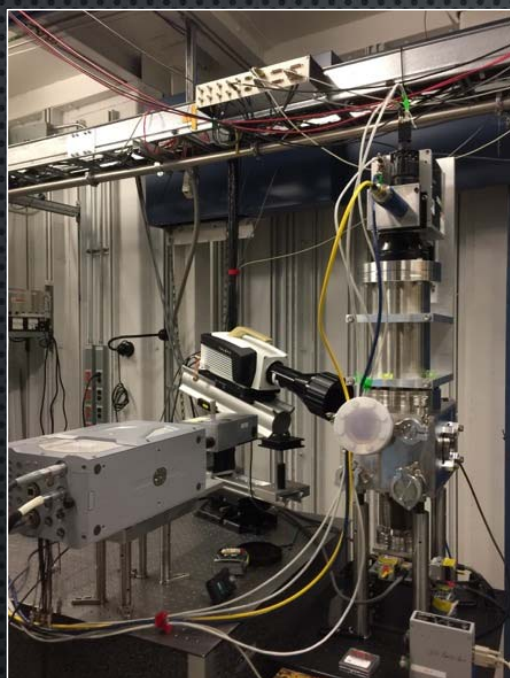
- × Lots of structure defects
- × Limited materials
- × Poor reliability
- × High-fidelity models

IN SITU HIGH-RESOLUTION SYNCHROTRON X-RAY EXPERIMENTS FACILITATE THE DEVELOPMENT OF ADDITIVE PROCESSES AND MATERIALS

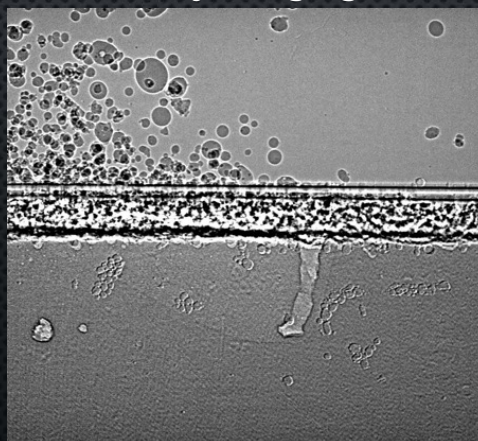


Advanced Photon Source

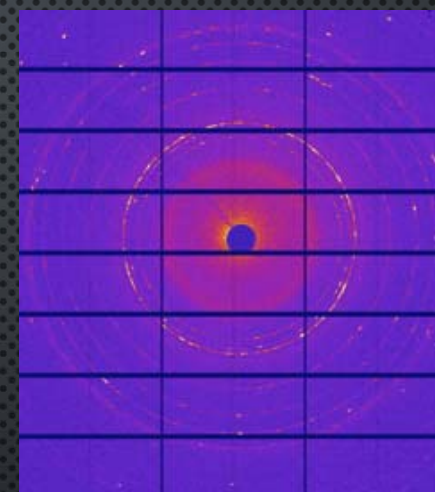
IN SITU/OPERANDO SYNCHROTRON X-RAY STUDIES



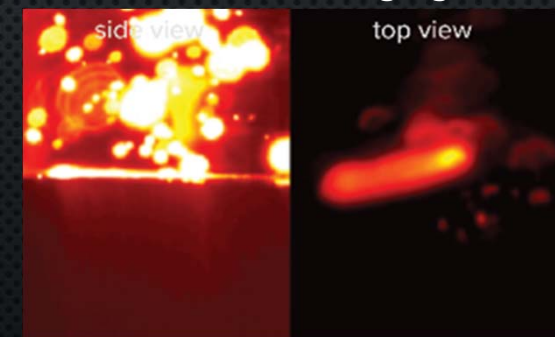
X-ray imaging



X-ray diffraction



Thermal imaging



C. Zhao, et al., *Sci. Rep.*, 7, (2017) 3602
N. Parab, C. Zhao, et al., *J. Synchrotron Radiation*, 25, (2018) 1467
R. Cunningham, Cang Zhao, et al., *Science*, 363, (2019) 849
N. Parab, et al., *Synchrotron Radiation News*, 32:2, (2019) 4