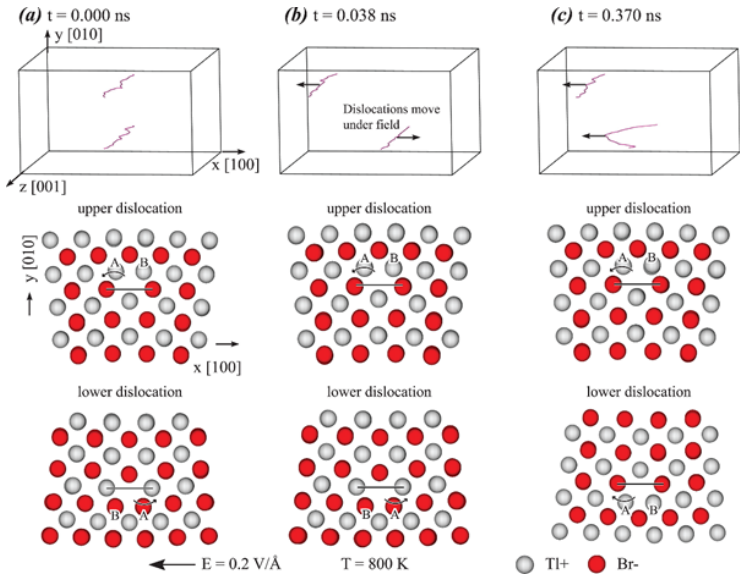
# THALLIUM BROMIDE (TlBr) SEMICONDUCTORS

**US Patent No. 10,516,068**
**SD# 14052**
**Technology Readiness Level: 3**
*Concept Demonstrated Analytically or Experimentally*

## A new approach to extend the life of Thallium Bromide (TlBr) crystals and devices

Researchers from Sandia National Labs have created a new approach to extend the life of thallium bromide (TlBr) crystals, enabling the development of high-performance gamma ray spectrometers.

TlBr has electronic properties needed for efficient room temperature gamma ray spectrometers; however, the properties can degrade rapidly under electric fields required for this application. New simulations indicate that dislocations in TlBr crystals move in response to electric fields applied to the crystals. This creates charged vacancies in the crystal lattice, which limit the operable lifetime of the device due to crystal polarization and electrical contact corrosion. The significance of this finding is that the useful life of TlBr crystals and detectors can be extended by controlling resolved electromotive forces on mobile defects, defect densities, and their mobilities. Sandia's approach to manufacturing TlBr crystals includes a variety of techniques and processes to inhibit formation or migration of these dislocations.




*New modeling approach reveals that previously neglected dislocations can be driven by electric fields.*

## TECHNICAL BENEFITS

- Higher photopeak efficiency than has been achieved in commercially available CZT
- Reduced rates of aging / delayed degradation in TlBr devices
- Easily implemented new manufacturing techniques

## INDUSTRIES & APPLICATIONS

- Radiation detection
- Biomedical (devices, medical imaging)
- Semiconductors
- Industrial equipment design and fabrication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