Potential of ellipsometry for screening collector fragments

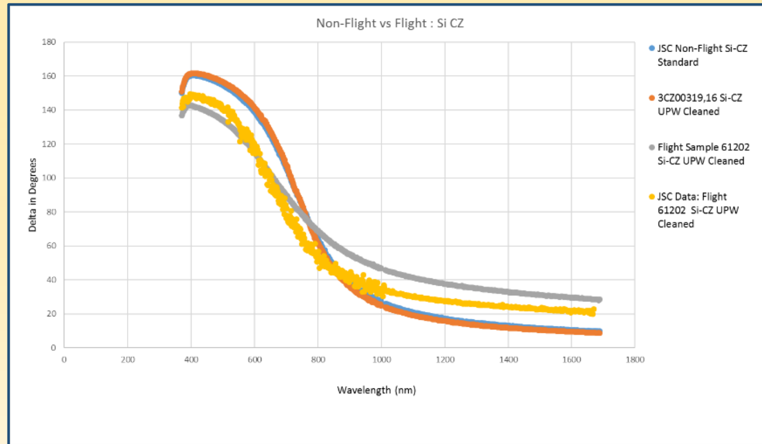
- Used to assess surface oxide thickness, especially on silicon
  Can we observe surface changes with time?
  Can we observe surface effects of cleaning chemicals?

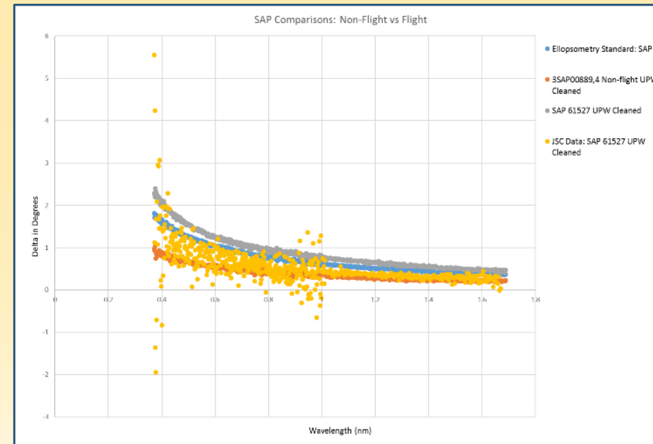
- May have potential for assessing effects of solar wind irradiation on crystal structure
  Can we observe differences among regimes?

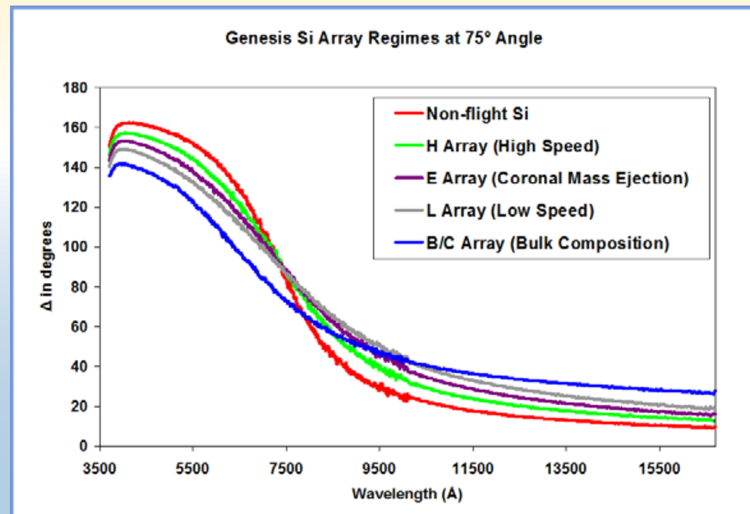
- Used to model thickness of epitaxial silicon on individual SOS fragments
  Can we make improved estimates of silicon volume on specific fragments?
  Assess variability of silicon layer thickness?

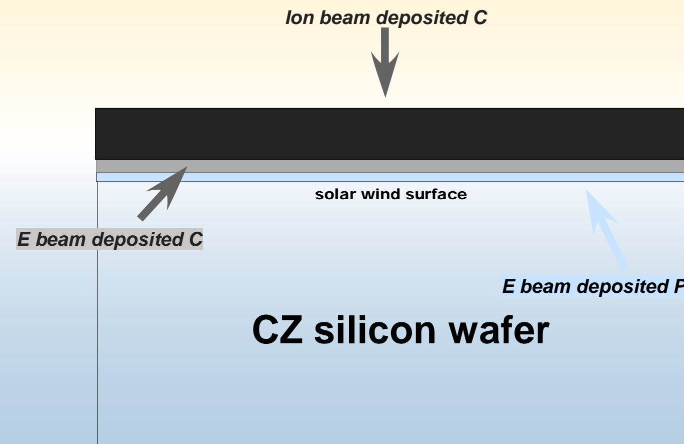
Ellipsometry is non-destructive and fast

Feasibility of calibrating ellipsometry modeling on Genesis collectors using FIB/TEM









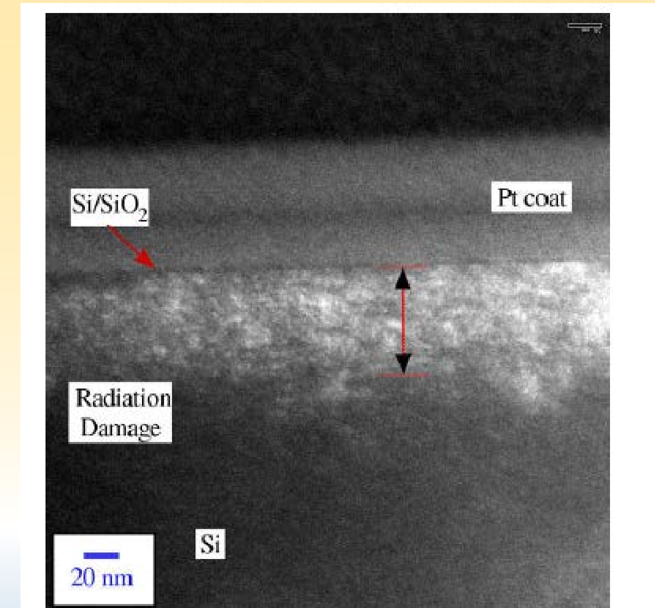
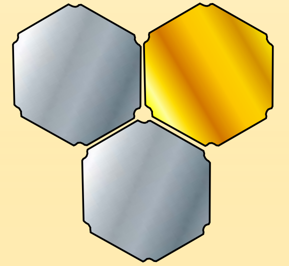


Fig. 2. FIB sample 60208.1 STEM dark-field image shows the 60–75 nm thick complex diffraction contrast below the native oxide surface layer. The 60.1 nm red scale-line highlights a typical EMA ellipsometry model thickness of Si substrate damage.

Three compendia:

- SCIENCE RESULTS
- COLLECTOR MATERIAL CHARACTERIZATION
- CLEANING TECHNIQUES AND CLEANLINESS ASSESSMENT



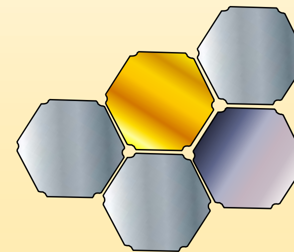
Proposed SCIENCE content

- **Element fluence results, precision**
- **Isotope ratios results, precision**
- **Analytical technique details, fractionation & blank corrections (e.g. internal standards via implantation)**
- **Cleaning technique and validation that cleaning did not alter solar wind**
- **Comparison to theoretical models**
- **Comparison to measurements by others**

Proposed SCIENCE organization

By element or element group
By solar wind regime
By analysis technique
By collector material
By broad science objective

- Solar nebula composition
- Interactions between Sun and planetary materials
- Solar physics



COLLECTOR MATERIAL CHARACTERIZATION

Proposed material characterization content

- Rationale for selection (early testing results)
- Fabrication method and batch
- Bulk composition
- Surface cleanliness assessment

CLEANING TECHNIQUES & CLEANLINESS ASSESSMENT

Proposed cleaning and cleanliness assessment content – both chemical and physical

- Technique (e.g. ultrapure water, HF, nitric acid, RCA1 semiconductor method)
- Cleanliness assessment (e.g. optical imaging, SEM, TRXRF, ToF-SIMS)
- Validation that cleaning technique did not alter solar wind (e.g. implanted reference ions)