



# Grazing X-rays and Electrochemical Interfaces

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# Outline

- Introduction to X-ray Diffraction
- Electrochemical methods
- Oxidation of Copper(111)
- Electrodeposition of Cu on Au(100)
  - Thin film regime
  - Structural instability of thick films



# Conclusions

- Inhomogeneous oxidation of Copper
  - Formation of monolayer
  - Columnar thickening to 65Å
  - Lateral spreading
  - Uniform growth regime
- Structural Instability of Cu on Au(100)
  - BCC structure in thin films
  - Striped instability of thick films



# Introduction to X-ray Diffraction

- Surface sensitivity by symmetry selection
- Crystal Truncation Rods
- Accurate lattice parameters
- Real space dimensions from lineshape



# Electrochemical methods

- *In-situ* Electrochemical cell
- Inflated and sucked-down configuration
- Three-terminal potential control
- 6-micron X-ray window
- Inert atmosphere beyond window



# Oxidation of Copper(111)

- Native and aqueous oxides compared
- Epitaxial cuprite,  $\text{Cu}_2\text{O}$
- Aligned and rotated orientations
- Stable monolayer regime
- Only *one* orientation thickens

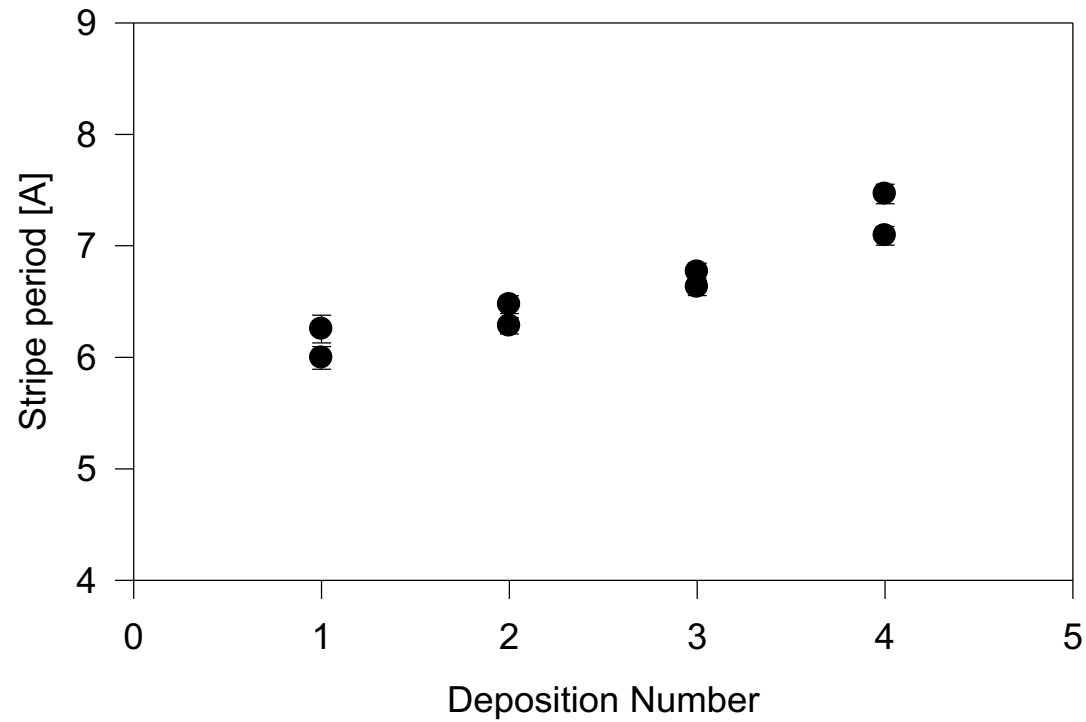


# Electrodeposition of Cu on Au(100)

- Lattice mismatch favors BCC
- Lattice-matched growth up to 10ML
- Energetically unfavorable vs BCT
- Striped phase above 10ML
- Strain relief without dislocations



# Variation of stripe period



# Bain distortion

