

# Smoothing, compaction, mixing and sputtering of semi-metal and halogenide coatings by SHI irradiation



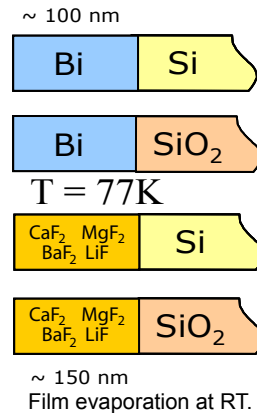
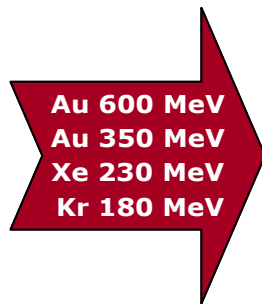
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## Motivation

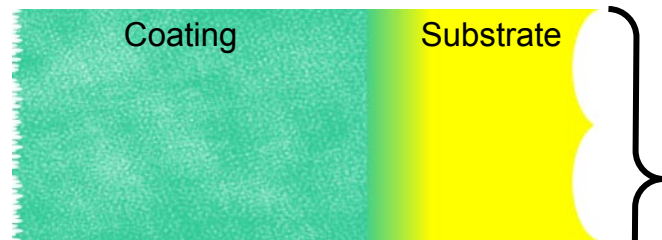
Previously:  
Investigation of SHI induced mixing in metals, insulators and semi-conductors.

Here:  
Response of semi-metals and ionic materials to SHI irradiation.

## Experiment

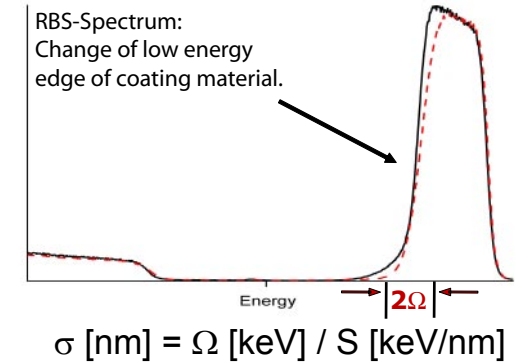


## Possible effects

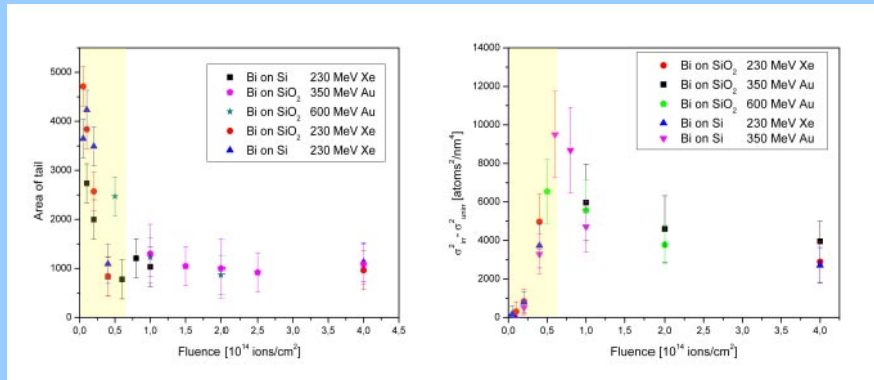


- Surface:** Smoothing, Roughening, Sputtering
- Bulk:** Compaction, Swelling, Amorphisation
- Interface:** Ion Beam Mixing, Phase formation, Phase separation

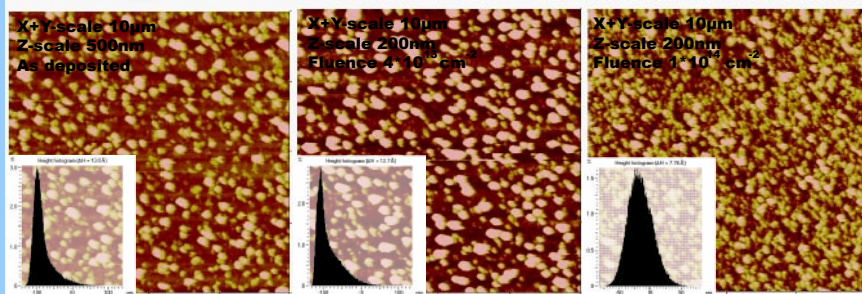
## Analysis



## Bismuth

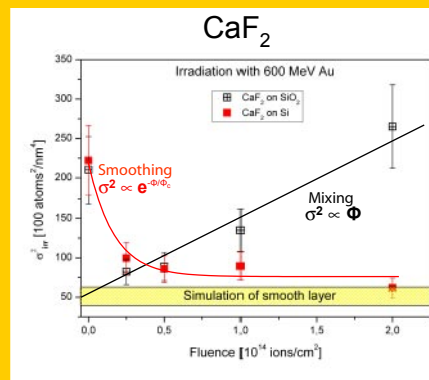


Asymmetric thickness distribution  $\longrightarrow$  Gaussian thickness distribution  
reduction of distribution width



Few large particles  $\longrightarrow$  Many small particles  
**ONLY SMOOTHING - NO MIXING WITH SUBSTRATE**  
SMALL SPUTTERING, SMALL COMPACTION

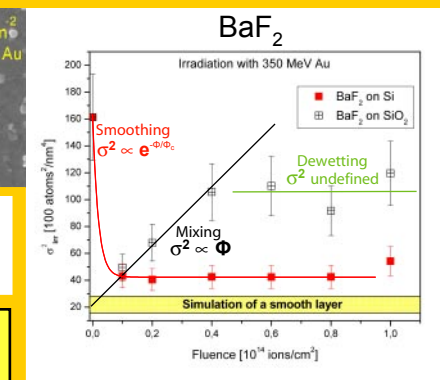
## Fluorides



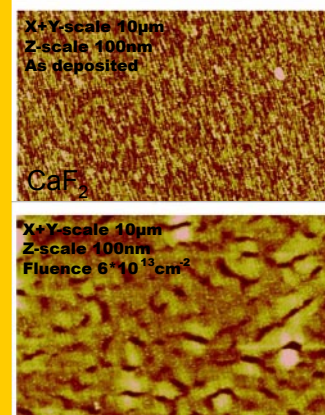
**Sputter yields for 350 MeV Au:**  
CaF<sub>2</sub> = 1000 BaF<sub>2</sub> = 2500

Sputtering, Smoothing, Mixing and Dewetting are larger or faster in BaF<sub>2</sub> as in CaF<sub>2</sub> by a factor of 2.5  
Effect of track radius?

Competition between Smoothing and Mixing



Smoothing, Mixing and Dewetting compete



LOW FLUENCES:  
SMOOTHING AND COMPACTION

MEDIUM FLUENCES:  
INTERFACE MIXING WITH SiO<sub>2</sub>

HIGH FLUENCES:  
DEWETTING BY **PLASTIC FLOW!**

