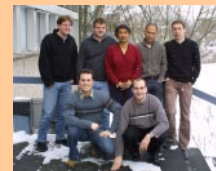


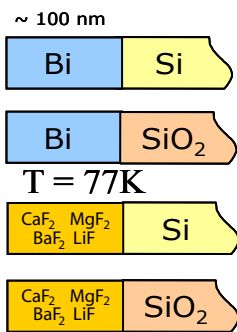
Smoothing, mixing and sputtering of semi-metal and halogenide coatings by swift heavy ion irradiation

H. Paulus and W. Bolse, Institut für Strahlenphysik, Universität Stuttgart



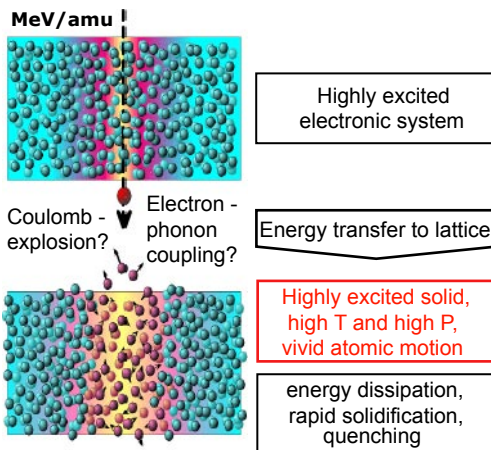
Experiment

Au 600 MeV
Au 350 MeV
Xe 230 MeV
Kr 180 MeV

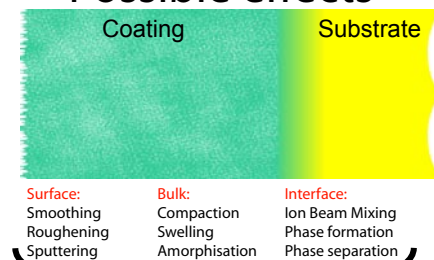


Film deposition by thermal evaporation at RT.

Track formation



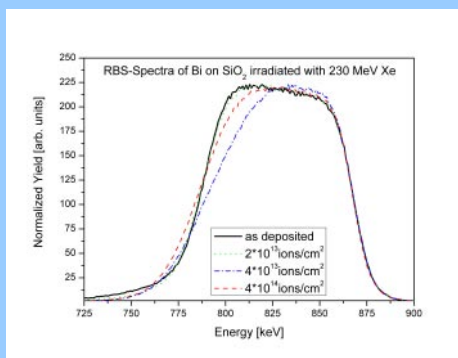
Possible effects



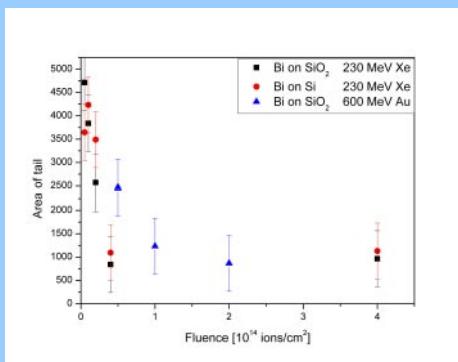
Surface: Smoothing, Roughening, Sputtering
Bulk: Compaction, Swelling, Amorphisation
Interface: Ion Beam Mixing, Phase formation, Phase separation

RBS-Spectrum: Change of low energy edge of coating material.

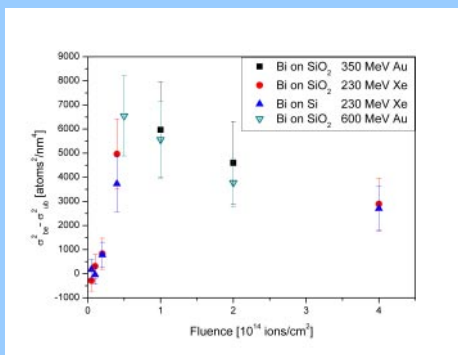
Bismuth



Reduction of tail and different states of mixing as seen in the RBS spectrum of Bi.

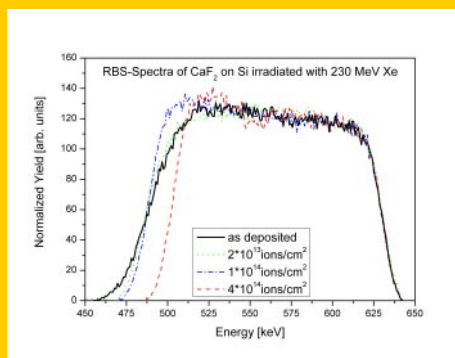


Reduction of tail area due to irradiation induced smoothing and compaction.

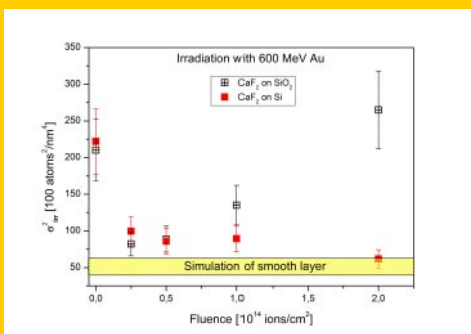


Mixing and Demixing at the interface. Phase separation? Recrystallization?

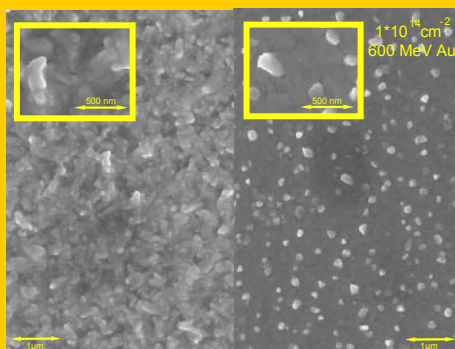
Fluorides



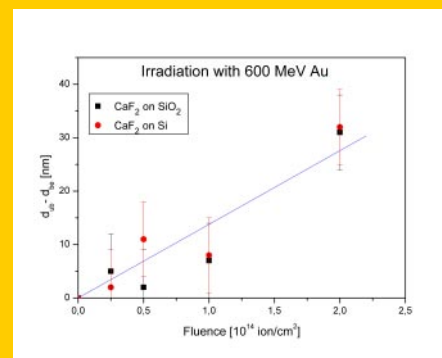
Smoothing and sputtering of fluoride coatings as seen in the RBS spectrum of Ca.



Surface smoothing, bulk compaction and interface mixing compared with a simulation of a perfectly smooth layer.



Scanning Electron Microscopy pictures of a CaF₂ surface as deposited and irradiated.



First results for sputtering of CaF₂. Normal incidence: Sputter yield ≈ 1000.

Sputtering of LiF coatings and single crystals

	Ion	Energy	Particles	Angle	Sputter yield
Toulemonde et al.	Au	210 MeV	≤ 1 E12	70°	10000
This work	Au	350 MeV	≈ 1 E13	90°	7000
This work	Au	350 MeV	≈ 1 E14	90°	1800
Toulemonde et al.	Au	210 MeV	≤ 1 E12	19°	43400
This work	Au	350 MeV	≈ 2,5 E13	15°	41800

Comparison of sputter yields for LiF single crystals and coatings at different angles.

Present and Future Experiments:

Deposition on heated substrates

Atomic Force Microscopy

Scanning Electron Microscopy

X-Ray diffraction

Intermixing of Fluorides

Analysis of compaction