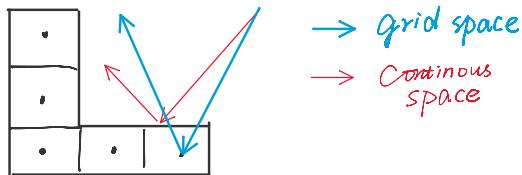


Reflection

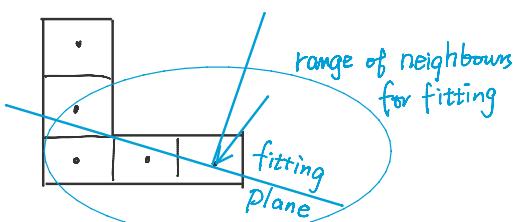
Wednesday, September 2, 2020 3:21 PM

REFLECTION

All Reflections occur on Nodes
instead of SURF



Find the reflecting surf
Cell surf is only horizontal or vertical
On nodes, surf is determined
by plane fitting

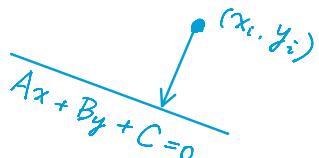


assume the fitting plane is

$$Ax + By + C = 0$$

for neighbours (x_i, y_i)

the distance from (x_i, y_i) to plane



$$\text{dist} = \frac{|Ax_i + By_i + C|}{\sqrt{A^2 + B^2}}$$

Minimize total dist

$$D = \sum_i \text{dist}(x_i, y_i)$$

Usually, a simpler form is used

$$Q = \sum_i (Ax_i + By_i + c)^2$$

This sum can be only fitted on nodes

Once the fitting plane is determined

surf norm \hat{n} is chosen from

Mat to Vac

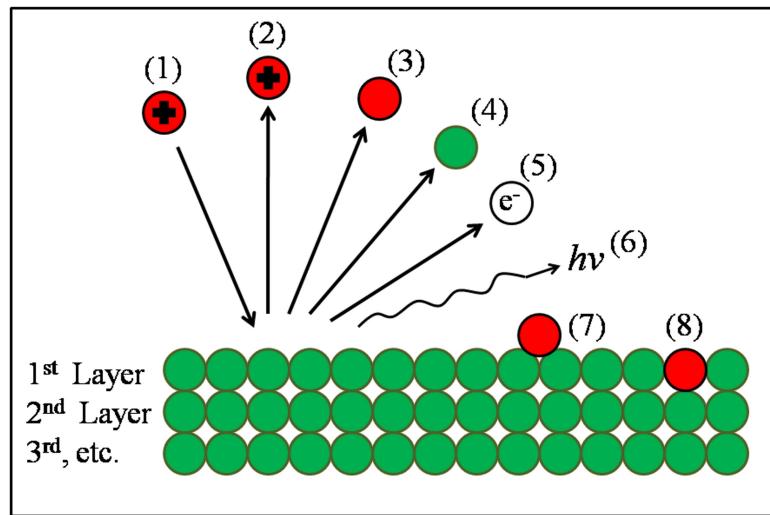
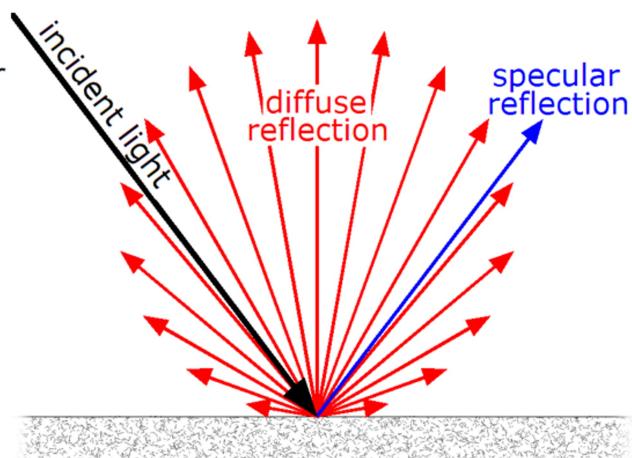
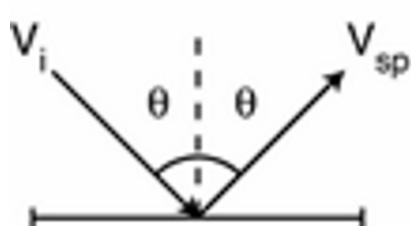
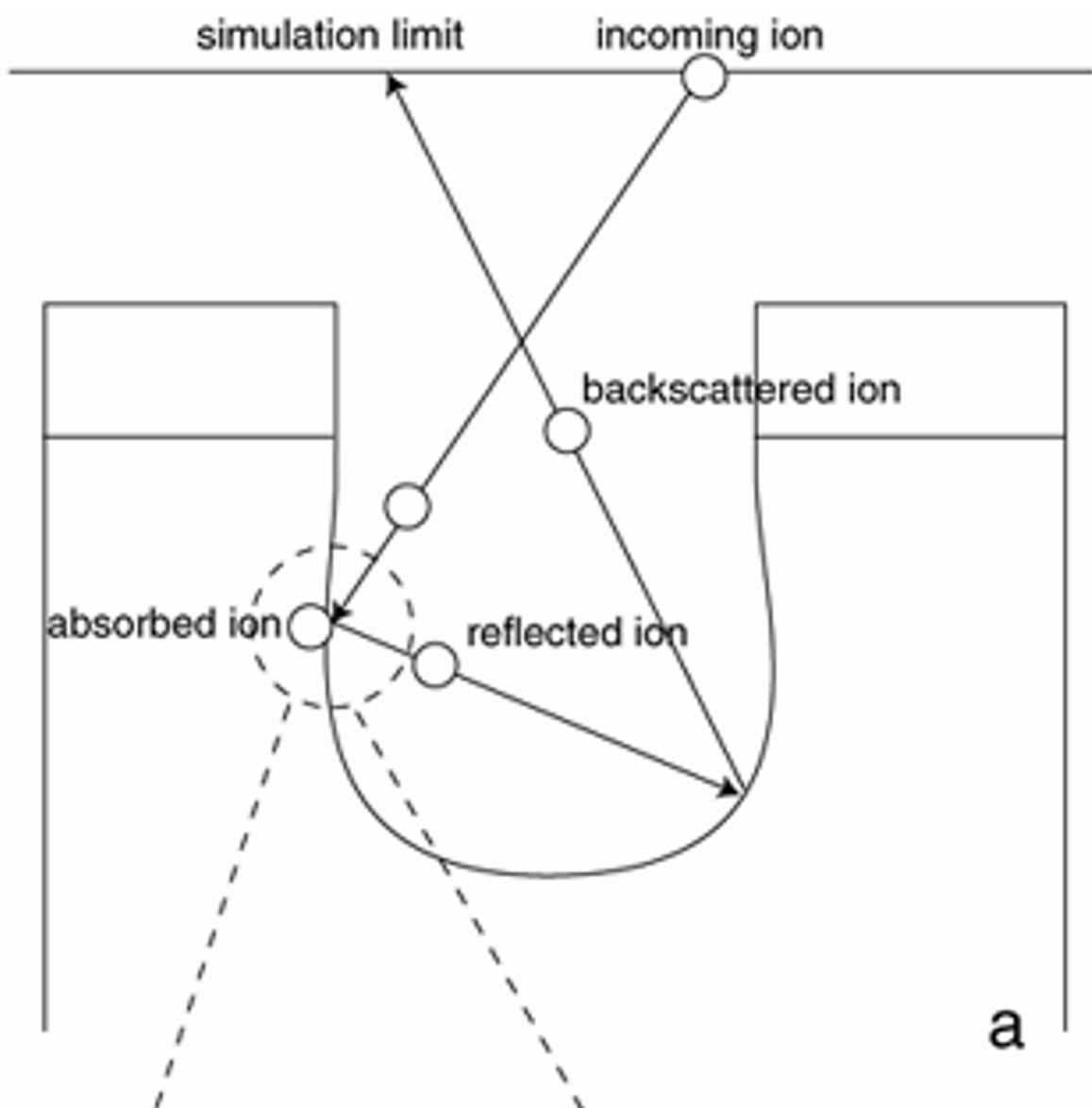


Diagram of various ion-surface interactions (non-exhaustive). (1) Incoming ion; (2) Scattering; (3) Neutralization and scattering; (4) Sputtering or recoil; (5) Electron emission; (6) Photon emission; (7) Adsorption; (8) Displacement.

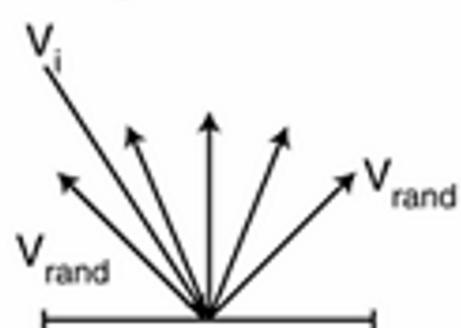
DIFFUSE REFLECTION

- Neutral particles with thermal, or near thermal (< 1 eV) energies reflect or re-emit from surfaces diffusively following a cosine angular distribution.
- This occurs because each particle is in thermal equilibrium with the surface, allowing them to briefly physisorb to the surface, before being re-emitted into the gas by vibrational processes in the solid, such as phonon scattering.
- The emitting probability density function depends on the particle and surface condition.





b



c

ENERGY LOSS DURING THE REFLECTION

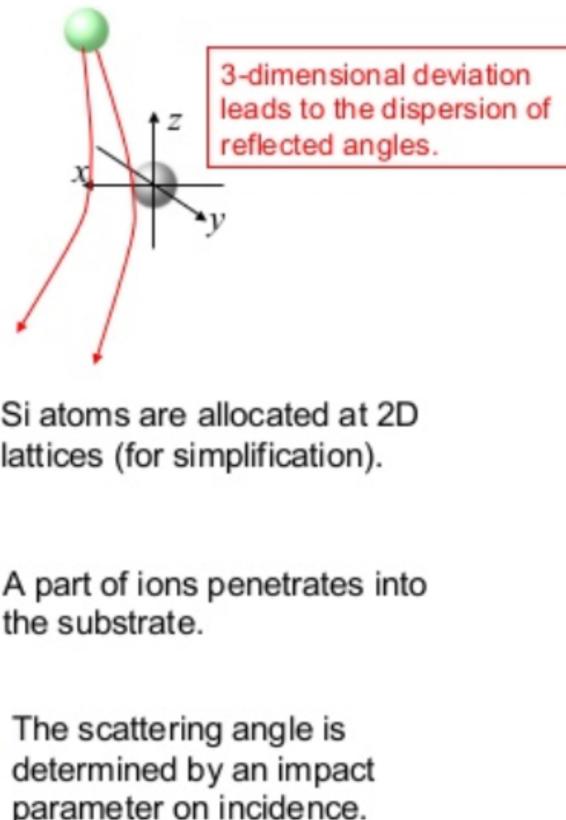
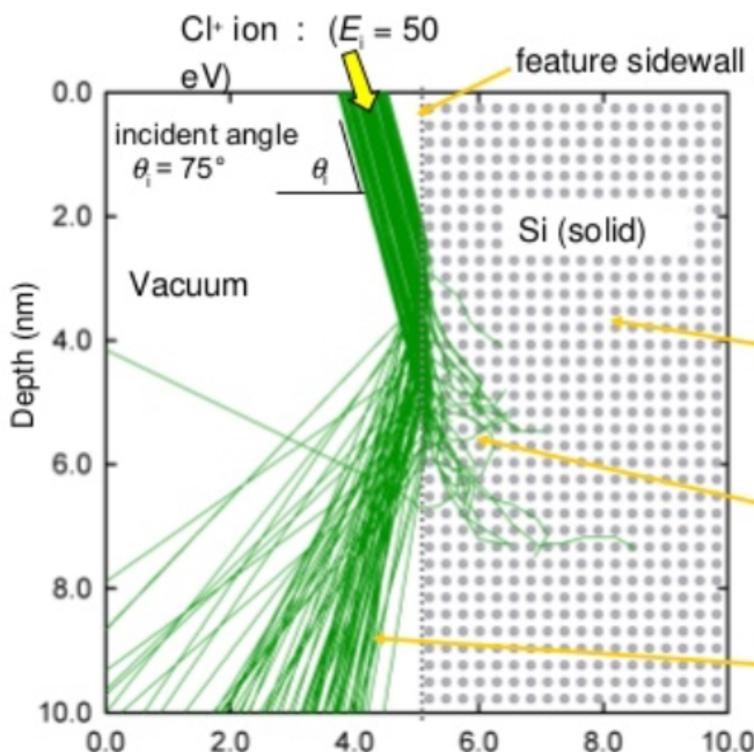
- Particles lose energy during the reflection as a function of initial energy and incident angle.

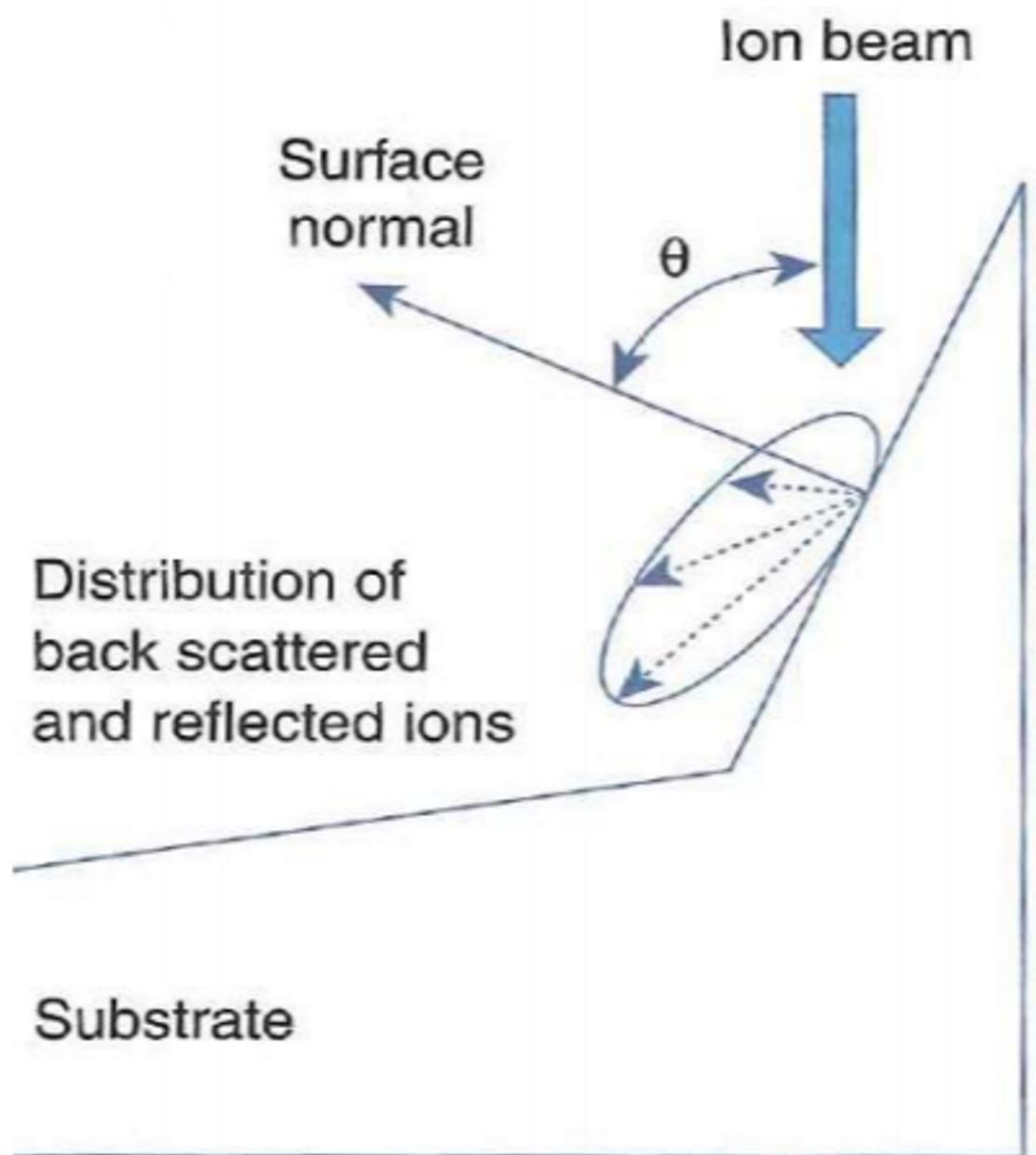
$$\varepsilon_f = \gamma_0 f(\theta) f(\varepsilon_i) \varepsilon_i$$

$$f(\varepsilon) = \begin{cases} 0 & \text{if } \varepsilon < \varepsilon_0 \\ \frac{\varepsilon - \varepsilon_0}{\varepsilon_s - \varepsilon_0} & \text{if } \varepsilon_0 \leq \varepsilon \leq \varepsilon_s \\ 1 & \text{if } \varepsilon > \varepsilon_s \end{cases} \quad f(\theta) = \begin{cases} 0 & \text{if } \theta < \theta_0 \\ \frac{\theta - \theta_0}{\theta_0} & \text{if } \theta > \theta_0 \end{cases}$$

for example, $\gamma_0 = 0.85$, $\varepsilon_0 = 0$ eV, $\varepsilon_s = 50$ eV and $\theta_0 = 30^\circ$

Sample trajectories of reflected ions





Ion beam gets deflected by tilted faces *