

Solid-Solid Interfaces

Lesson 8

MSE 304

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Key Topics in the Previous Class

Reading for this Class

Questions to be answered in Class

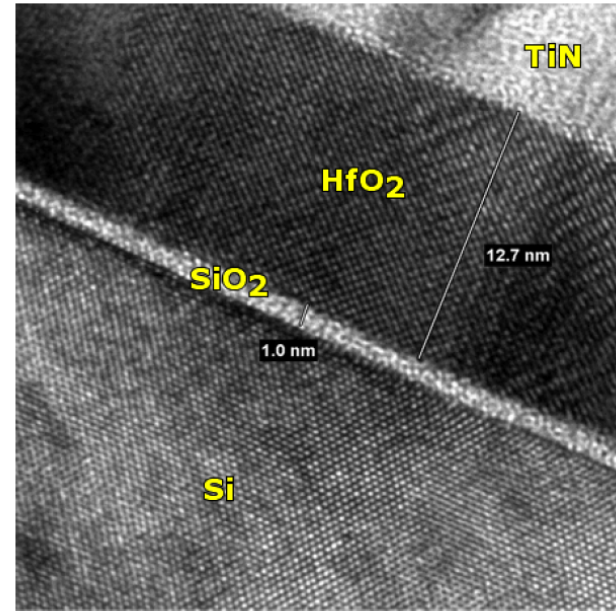
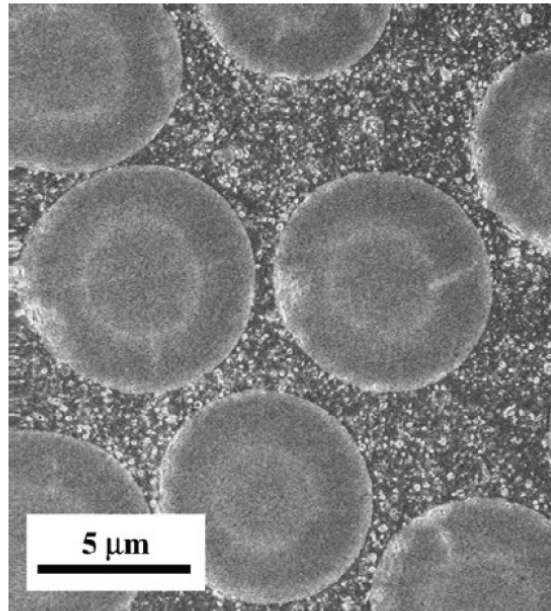
Solid-Solid Interfaces

Solid-Solid Interfaces

- Most bulk materials are polycrystalline, composed of many grains with different orientation
 - Grain boundaries affect mechanical or electronic properties
 - The story gets even more complex when it comes to interfaces between different phases (heterophase interfaces)



Solid-Solid Interfaces



Homophase and Eteropahse Solid-Solid Interfaces

Homophase and Heterophase Solid-Solid Interfaces

Homophase Solid-Solid Interfaces

Solid-Solid Interfaces

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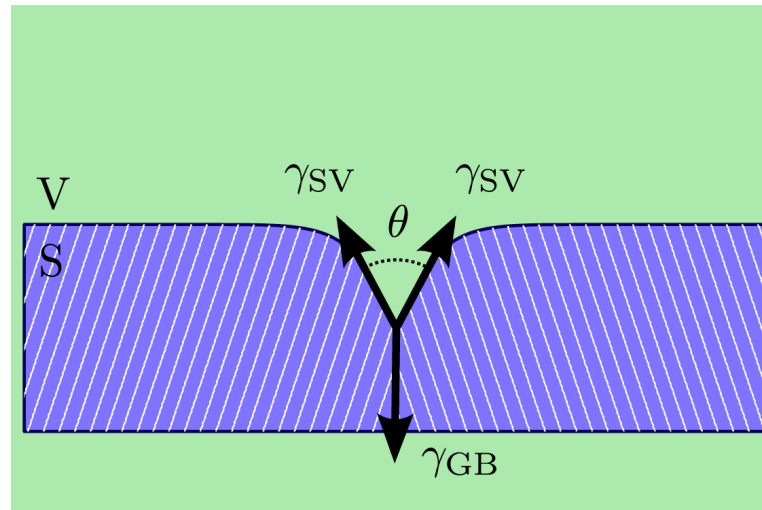
- One can associate a surface-energy term γ_{GB} to the presence of GBs

$$\gamma_{GB} = 2\gamma_{SV} - W_{GB}$$

- The GB energy can be estimated by thermal grooving
- Balance between surface energy γ_{SV} and γ_{GB} (typically $\gamma_{SV} \approx 3\gamma_{GB}$)

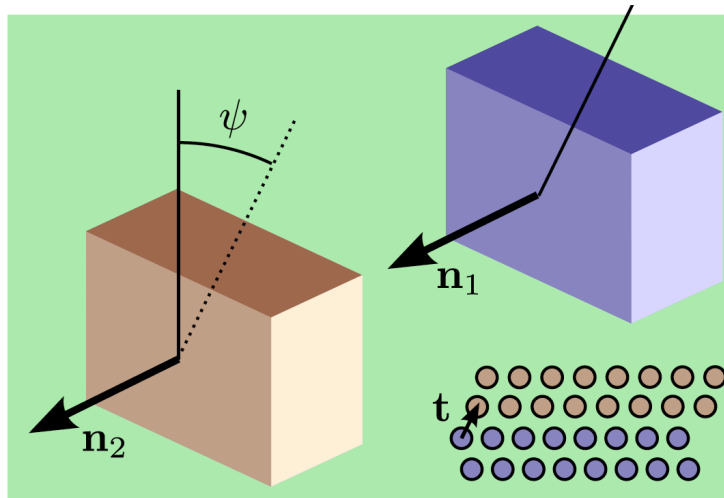
$$2\gamma_{SV} \cos \frac{\theta}{2} = \gamma_{GB}$$

- What happens if $\gamma_{GB} > 2\gamma_{SL}$?



Solid-Solid Interfaces

- How many parameters we need to describe the geometry of a GB?
 - Orientation of the two surfaces + relative tilt = 5 degrees of freedom
 - Atomic-scale register between the surfaces
- Simpler geometry - symmetric tilt boundaries



Conclusions
