

8.2.3 Summary to: 8.2 Making Bulk Si Solar Cells

Bulk **Si** solar cells are made from (cheap) single crystalline wafers (cut squarish) or from square multicrystalline (**mc**) wafers. They account for about **85 %** of the installed solar power at present (2008).

- A yearly production of **1 GW_{peak}** means about **10⁷ m²=10 km²** pn-junction of good quality and much more

- Consider →

A big problem is cranking up world wide **Si** production by **30 % - 40 %** per year.

Processing Time	1s / solar cell
Cost Decrease	5 % / a
Efficiency Increase	20 % in 2012 ?
Key Material Supply	30 % / a more Si
Industry Growth Rates > 30 % for many years	Supply capital and people

mc wafers are produced by **Si** casting. Problems are

- Expansion upon crystallization.
- Reaction with walls of mold
- Columnar grain growth required
- **300 kg** ingots are routinely cast in **2007**; liquid encapsulation and precise temperature control are essential

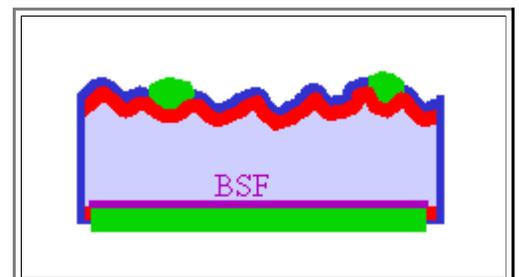
Sawing the ingot into **mc-Si** wafers with as little losses as possible and with wafer thicknesses of **< 300 μm**, while straight-forward, is "high-tech".

- Saw damage is removed by a chemical etch.



Processing, simple in principle, has to meet the conditions above and is highly specialized. Essential processes are:

- Diffusion, edge isolation, passivation, screen printing contacts and sintering contacts.
- Essential device features are back surface field, gettering of impurity atoms, **H**-passivation of grain boundaries and other defects.



Exercise 8.2-1

Summing up Class Exercises