

Float Zone Crystal Growth

Advanced

The basic idea in float zone (FZ) crystal growth is to move a liquid zone through the material. If properly seeded, a single crystal may result.

- The method was first used for purification (**zone melting**), taking advantage of the small [segregation coefficients](#) of many impurities. The impurities contained in the feed material would then prefer to remain in the melt and thus could be swept to the end of the feed stock.
- If properly done, the newly crystallizing material could be obtained as a single crystal. Again, it was the **Siemens AG** that pioneered the use of FZ crystal growth for the production of high-quality **Si** single crystals.
- Since the melt never comes into contact with anything but vacuum (or inert gases), there is no incorporation of impurities that the melt picks up by dissolving the crucible material as in the [CZ crystal growth method](#). This is especially true for oxygen, which can not be avoided in CZ crystal growth. FZ crystals therefore are always used when very low oxygen concentrations are important.
- The problem of FZ crystal growth is clear, however, if one looks at the drawing: How do we keep the liquid Si from just collapsing? If it would only be held in place by *surface tension*, the maximum diameter of crystals possible in this way would be about **20 mm** - not very useful. There are, fortunately, other stabilizing mechanisms, and drawing the liquid zone through a "hole" - as indicated - also helps. Still, for large diameter crystals the difficulties grow rapidly and FZ crystal growth is rarely (if at all) used for diameters larger than **150 mm**.

