Technical Assistance Request.

This project concerns the development and industrialization of the continuous horizontal ribbon growth (HRG) process for making wafers for solar cells.

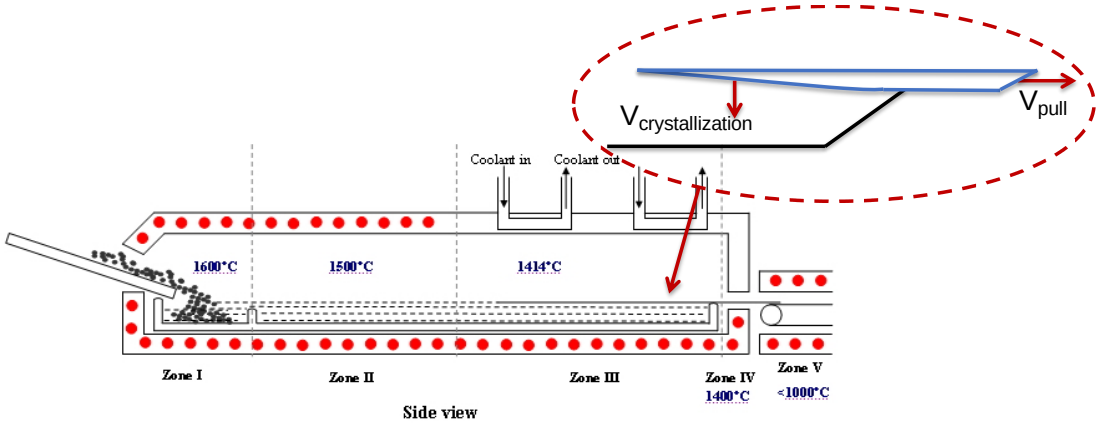

Figure 1: The Horizontal Ribbon Growth Process.

The basic concept for HRG (shown in Figure 1) has been known since it was disclosed by Shockley in 1962. However, the process is very unstable and it is difficult to control crystal growth near the tip of the solidifying ribbon.

We have discovered a new way to operate the process and we believe can control the micro- and nano-structure of growth near the tip of the ribbon using an innovative operating procedure. We have shown theoretically (in detailed computer simulation studies) that we can stabilize the process as seen in the inset in Figure 1. We will continue the theoretical work, but the main thrust of our program is to verify the control concept in our pilot plant system.

The 60kW system is capable of producing a 15cm wide ribbon. However, our first major milestone is to produce a 5 cm wide ribbon with controllable thickness and few crystal defects within a year.

We work within a University Environment so we have access to standard machining and analytical tools. However, some technical assistance will be

very helpful in the accelerating the horizontal ribbon growth project and demanding measurements and fabrication is beyond our capabilities.

1. We need access to persons with
    a. Significant expertise in the area of silicon crystal growth.
    b. Solar cell characterization.
    c. Electric property measurements.
    d. Materials characterization.
2. We will need to make a number of dense graphite parts. We need to machine crucibles for melting. In order to make these parts it is necessary to SiC - CVD coat these parts.
3. Cooperative agreements with laboratories that have capabilities to
    a. measure electrical properties of silicon wafers,
    b. determine crystallinity and surface structure of silicon wafers, and
    c. ability to measure low level (ppm and below) of typical impurities such as oxygen, phosphorous, boron, carbon, and iron +++

   are sought.
4. Cooperation with a cell fabrication facility that can perform
    a. surface treatment and texturing,
    b. doping and anti-reflective coating, etc., and
    c. measure solar conversion efficiency

   is important in the later stages of this research
5. We also need experts in engineering design, scale-up and general EPC work to help move the project to industrialization.