# Crystallization processes for photovoltaic silicon ingots and their effect on solar cell performance

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Photovoltaic silicon ingots can be grown by different processes depending on the target solar cells: for monocrystalline silicon based solar cells the common choice is the Czochralski (CZ) process, while for multicrystalline silicon based solar cells directional solidification (DS) is preferred. Both processes depend on different parameters, e.g. temperature, growth speed, feedstock and crucible quality [1,2,3] etc.

The crystallization process is crucial for the final quality of the silicon ingots and, in turn, for the final quality and performance of the silicon solar cells [4]. In this work, we report on different studies related to both CZ and DS processes. For monocrystalline silicon ingots, we present the effect of pulling speed and temperature on the oxygen defects distribution and their role on the solar cell lifetime and efficiency. For multicrystalline silicon ingots we present the results of high-performance multicrystalline (HPMC) ingots with focus on the role of grain boundaries and grain boundary types on the recombination activity and electrical properties of the cells.

**References**

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