Abstract :

The silicon crystals used in the technology of semiconductors are produced primarily by the Czochralski technique. Direct current magnetic field is used to reduce nondesired turbulent flows and fluctuations associated with melt convection during solidification to help eliminating solidification defects and striations. This work aims to report the effect of transverse and axial magnetic fields on silicon Czochralski crystal growth in hemispherical crucible with rotating crystal and crucible. The reported results indicate significantly different flow patterns and pressure field in the melt, at the free surface and the crystal-melt interface when axial and transverse magnetic fields are applied. Transverse magnetic field decreases melt convection in the spherical crucible but it leads to symmetry breaking in velocity and pressure fields. The axial magnetic field makes the flow pattern and pressure much simpler with no symmetry breaking.