

Abstract

Method For The Crystal Pulling Of A Doped Monocrystalline Crystal From Silicon

A method of crystal pulling of a monocrystalline crystal from a melt composed of silicon and a dopant according to Czochralski, comprising the following steps in the sequence given:

(a) performing a time-dependent computer simulation of a predefined crystal pulling process with a predefined dopant concentration C in the melt, with the aim of obtaining a temperature gradient $\partial T / \partial n$ and a gradient of the dopant $\partial c / \partial n$ for each time increment t , where the two gradients are ascertained at the interface between crystal and melt in the normal direction of the interface to the melt,

(b) ascertaining a maximum dopant concentration $C_{\max}$ in the melt and

(c) pulling a single crystal with a dopant concentration less than the ascertained maximum dopant concentration $C_{\max}$, wherein

a parameter CS is calculated for each time increment t , which is determined via the formula $CS = \partial T / \partial n - f_{CS} \partial c / \partial n$,

where the parameter f_{CS} is determined by the product of the average concentration of the dopant C in the melt, the density of the silicon melt, Avogadro's constant, the molar mass of silicon and the slope of the liquidus line, and then an average $\overline{CS}$ of the values obtained for the parameter CS is formed, where a contribution is made only by those values having a CS value of less than zero, and a maximum dopant concentration $C_{\max}$ is ascertained by fitting the above-defined dopant concentration C to the magnitude of $\overline{CS} = \text{zero}$.

Figure relating to abstract: **Figure 2**