METHODS OF MANUFACTURING MONOCRYSTALLINE SILICON INGOTS AND WAFERS BY CONTROLLING PULL RATE PROFILES IN A HOT ZONE FURNACE, AND INGOTS AND WAFERS MANUFACTURED THEREBY

Abstract of the Disclosure

A silicon ingot is manufactured in a hot zone furnace by pulling the ingot from a silicon melt in the hot zone furnace in an axial direction, at a pull rate profile of the ingot from the silicon melt in the hot zone furnace that is sufficiently high so as to prevent interstitial agglomerates but is sufficiently low so as to confine vacancy agglomerates to a vacancy rich region at the axis of the ingot. The ingot so pulled is sliced into a plurality of semi-pure wafers each having a vacancy rich region at the center thereof that includes vacancy agglomerates and a pure region between the vacancy rich region and the wafer edge that is free of vacancy agglomerates and interstitial agglomerates. According to another aspect of the present invention, the ingot is pulled from the silicon melt in the hot zone furnace at a pull rate profile of the ingot from the silicon melt in the hot zone furnace that is sufficiently high so as to prevent interstitial agglomerates, but is also sufficiently low as to prevent vacancy agglomerates. Accordingly, when this ingot is sliced into wafers, the wafers are pure silicon wafers that may include point defects but that are free of vacancy agglomerates and interstitial agglomerates.



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