To Study the Preparation Processes of High Porosity SiO2 Nano-powder by Hydrothermal Method

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ABSTRACT

The material of this recycling study is dealing with the wasted silicon dioxide crucible pieces, which is the container for pulling the single crystal Si ingot. In here, physical metallurgy processes were applied to manufacture the high porosity noncrystalline nano-powder. The pre-experimental procedures to deal with the wasted crucible are crushed, sieved, magnetic separated and acidic leaching, to be the experimental material. With hydrothermal process proceed, material will be dissolved and recrystallized, to convert into the powder products. All the products obtained from different process parameters, were examined the morphology and analyzed the crystalline structure, to presumably the growth mechanism.

From experimental results showed that, test proceed at 190±5℃ temperature range, under 9 hr hydrothermal holding time, the experimental powder did not dissolve completely. However, at 12 hr holding time, powder will completely transform into high porosity nanoscaled noncrystalline flake-like products. Further increased holding time to 15 hr, in addition to the size of flake thickening, also observed prism-shaped α-quartz particles. Also found, increasing the concentration of solution, will accelerate the dissolving and crystallization rate, to promote the nucleation and growth of crystalline α-quartz. As for changing the cooling mode, no significant effect on the morphology, but seems benefit to α-quartz growth.

Keywords: Wasted Silicon Crucible Pieces, Hydrothermal Process, High Porosity Noncrystalline Flake-like...

REFERENCES