
题 目： 一维氮化硅材料的制备及生长机理

摘要

氮化硅材料在现如今已是重要的结构材料之一，在机械工程、冶炼金属、微电子等多个领域有着广泛的用途。而要发展更高性能的氮化硅材料，高纯超细的氮化硅粉体是研究的基础和关键。一维氮化硅材料与氮化硅的块体材料相比，一维氮化硅具有更均匀的微观结构、更高的比表面积和表面能、优异的力学性能、热性能和半导体性能。因此，研究制备一维氮化硅材料的方法在实际应用中具有重要的意义。

本文基于已有的研究基础，针对一维氮化硅材料的结构进行分析，实验采用从废砂浆提纯后的硅，然后通过直接氮化法合成一维氮化硅，得到氮化产物后再用 XRD、SEM 及红外吸收光谱仪对其进行表征分析，研究原料/添加剂质量比、加热温度、加热时间对一维氮化硅物相、含量、形貌和结构的影响，并研究其生长机制，希望对一维氮化硅材料的研究起到一定推动作用。

关键词：氮化硅；一维材料；显微结构；直接氮化法；生长机制

Abstract

Nowdays silicon nitride is one of the important structural materials, in mechanical engineering, metal smelting, microelectronics and other realms, it has a wide use. In order to develop silicon nitride materials with higher performance, high-purity and ultra-fine silicon nitride powder is the basis and key of research. Compared with silicon nitride bulk materials, one-dimensional silicon nitride materials have more uniform microstructure, higher specific surface area and surface energy, excellent mechanical properties, thermal properties and semiconductor properties. Therefore, studying the preparation method of one-dimensional silicon nitride in practical application it has great significance.

This paper analyzes the structure of one-dimensional silicon nitride materials based on the existing research foundation. In this experiment, silicon purified from waste mortar was used, then one dimensional silicon nitride was synthesized by direct nitriding method. Then using X-ray diffraction, scanning electron microscopy and Infrared absorption spectrometer to characterize the products of nitriding. Discuss that raw material / additive mass ratio on the phase, heating temperature, heating time how to effect content, morphology and structure of one-dimensional silicon nitride, and study on its growth mechanism, it is hoped to promote the research of one-dimensional silicon nitride materials.

Keywords: Silicon nitride; one dimensional material; microstructure; direct nitridation; growth mechanism

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