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铅基复合钙钛矿型弛豫铁电单晶的生长基元与生长机理**1: PMNT**单晶的表面形貌 、负晶结构及生长基元的组装与拆分

许桂生,罗豪Su,仲维卓,殷之文,刘克

湘潭工学院;中国科学院上海硅酸盐研究所.上海(200050);中国科学院无机功 能材料开放实验室

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摘要 铅基复合钙钛矿型弛豫铁电单晶体PMNT的生长基元为多种[BO~6]配位八面体,
晶体生长过程可视为多种八面体基元与Pb^2^+的组装过程。这些生长基元向{111}面叠合时易采取法向生长机制,向{001}
面叠合时易采取层状生长机制,
由此决定了晶体生长速度的各向异性与晶体的形貌。Bridgman法生长的PMNT晶体在生长过程中由内向生长机制形成规则的负晶结构;
在晶体生长过程中,在其自然表面上可形成正形与负形两种形貌;在高温退火过程中,由于PbO的分解,晶体表面上可形成类似"蚀象"的构型,
这些可从[BO~6]八面体生长基元的组装或拆分方面获得解释。

关键词 钙钛矿型结构 弛豫 铁电晶体 晶体生长 氧化镁 氧化铌 氧化铅 钛酸铅

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Growth units and growth mechanism of lead-based complex perovskite relaxor ferroelectric single crystals: I. The surface morphology, negative crystal structure and assembling or unlinking of growth units in PMNT crystals

Xu Guisheng,LUO HAO,Zhong Weizhao,Yin Zhiwen,Liu Ke

Shanghai Inst Ceram., CAS.Shanghai(200050)

Abstract This paper discusses the relation between the surface morphologies and negative crystal structures as well as the assembling or unlinking of growth units in PMNT crystals. The growth units in relaxor ferroelectric single crystals PMNT and PZNT, which belong to lead-based complex perovskite structures, are considered as coordination octahedra [BO~6] and the growth process as the assembling of these units. These crystals are formed via a normal growth mechanism when their units grow on the {111} faces. However, the layer-by-layer growth mechanism is in operation when the units grow on {001} faces. This decides the anisotropy of growth rates and the crystal morphologies. The negative crystal structures of the PMNT single crystals with regular facets grown by the Bridgman technique could occur when the crystals grew from the melt surrounded by frozen crystals. The special surface morphologies, including positive and negative ones, could form during the period of crystal growth. Furthermore, a regular negative configuration on the surface of crystal plates as if being etched, could stem from the decomposition of PbO after annealing at high temperature. All of these phenomena could be rationalized by the mechanism of the assembling and unlinking of the [BO~6] octahedral growth units.

Key words PEROVSKITE TYPE STRUCTURE RELAXATION FERROELECTRIC CRYSTALS CRYSTAL GROWTH MAGNESIUM OXIDE NIOBIUM OXIDE LEAD OXIDE

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