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Sintering of Mechanically Activated Magnesium-titanate and Barium-zinc-titanate Ceramics

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Abstract:

In this article the influence of mechanical activation on sintering process of magnesium-titanate and barium-zinc-titanate ceramics has been investigated. Both non-activated and mixtures treated in planetary ball mill for 80 minutes were sintered at 1100^oC and 1300^oC. The influence of mechanical activation on phase composition and crystal structure has been analyzed by XRD, while the effect of activation and sintering process on microstructure was investigated by scanning electron microscopy. It has been established that temperature of 1100^oC was to low to induce final sintering stage for both systems. Moreover, we concluded that barium-zinc-titanate ceramics exhibited better sinterability than magnesium-titanate ceramics.

Keywords: *Ceramics; Mechanochemical processing; Sintering; SEM.*

1. Introduction

Development of dielectric binary and ternary materials based on TiO_2 such as barium, strontium and magnesium-titanates, as well as barium-strontium and barium-zinc-titanates is increasing with a rapid progress in mobile and satellite communications systems. These materials can difer extremely low dielectric loss in the microwave range and high dielectric constant [1-3]. Recently barium-zinc-titanate compounds and magnesium-titanate based materials ($MgTiO_3$ and Mg_2TiO_4) have attracted great attention for their specific microwave properties. As a result they can be used as parts of resonators, filters and multilayer ceramic capacitors [4].

These materials are often synthesized by solid state reaction between MgO, TiO_2 and $BaCO_3$, ZnO, TiO_2 at relatively high temperatures [5,6]. It has been established that sintering temperature can be lowered down owing to magnesium-titanate and barium-zinc-titanate preparation in nanocrystalline form. In order to produce nanocrystalline powders and improve the final properties of advanced ceramics, among the other methods, high energy mechanical

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