Thesis Summary

ESTUDIO DE CERÁMICAS PIEZOELECTRICAS LIBRES DE PLOMO PROCESADAS POR MICROONDAS.

STUDY OF LEAD-FREE PIEZOELECTRIC CERAMICS PROCESSED BY MICROWAVE.

Danny Anggel Lagunas Chavarría.

Universitat Politèctnica de València

Centro de Tecnología Avanzada, CIATEQ.

Industry demands new methods of processing materials in order to improve its properties. Priory requirements in new processes involve the reduction of energy consumption and processing time. In that sense, if heating is required during the process, heating by microwave radiation has showed some important advantages in comparison with conventional heating. Microwave heating is a non-conventional technique that involves high heating rates and rapid processing times. The properties of most materials heated by microwave radiation showed similar or superior properties than the obtained by conventional processing.

Materials such as zirconium, alumina, and some metals has been sintered by microwave heating, while other inorganic compounds as oxides has been synthetized successfully by applying different microwave heating techniques. In the other hand, the processing of piezoelectric materials by microwave of energy remains with minor research. So far, there's a lack of literature about microwave radiation to process piezoelectric materials, therefore, it's necessary to be explored.

Furthermore, this research focuses on studying the processing lead-free piezoelectric materials, based on the compound (K-Na)NbO_3 by using microwave radiation. Ceramics based on this compound have shown high piezoelectric properties, such as d_{33} constants greater than 300 pC / N becoming a possible substitute of the toxic PZTs.

Ceramics based on (K-Na)NbO_3 were synthesized by microwave-assisted solid-state reaction route. The obtained powders were formed at 650°C during 10 minutes by a heating which represents 90% less of the conventional time.

Microwave sintering of (K-Na)NbO_3-based ceramics at 1100°C during 10 minutes generates dense ceramics, with similar densities than the conventional sintering, reducing its sintering time. However, structural heterogeneities were formed in the process influencing the ferroelectric, dielectric and piezoelectric ceramics properties.