Centro de Investigación en Materiales Avanzados, S.C.

SYNTHESIS OF $BaTiO_3$ NANOFIBERS BY ELECTRO-SPINNING

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ABSTRACT

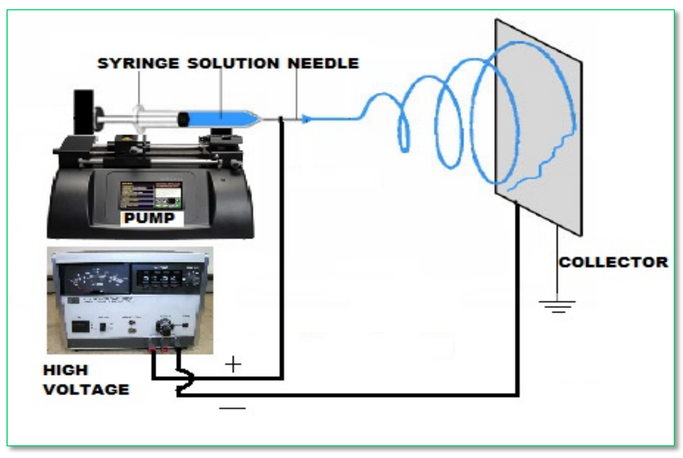
Barium Titanate nanofibers were synthesized by the electrospinning method, this process represents a convenient method for preparing polymer fibers and ceramic fibers[1].
The as-spun and morphology, microstructure and crystal structure of calcined composite nanofibers were characterized by Thermogravimetric Analysis (TGA), differential scanning calorimetry (DSC), scanning electron microscopy (SEM), X-Ray Diffractometry (XRD) and Transmission Electron Microscopy (TEM). The nanofibers were synthesized and the particular size was between 90 and 180 nm.

INTRODUCTION

Ferroelectric materials can be defined as materials that show net spontaneous polarization, this can be used to form digital signals such 1 and 0 and they are the basis of memory and logic circuits. [3]

EXPERIMENTAL

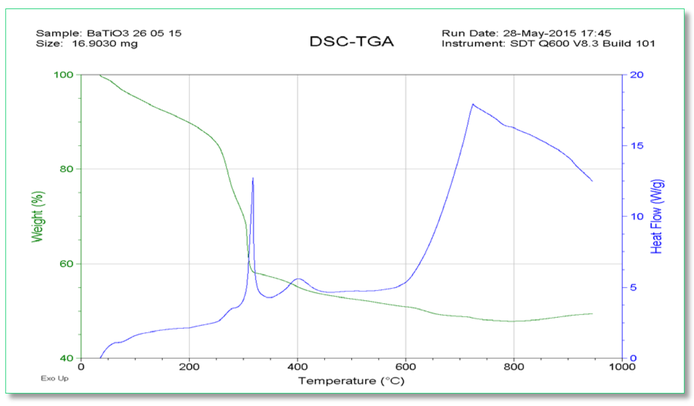
Barium acetate was dissolved in acetic acid and stirred for 2 h, then titanium isopropoxide was added drop by drop. The solution was mixed with polyvinylpyrrolidone (PVP) and ethanol.



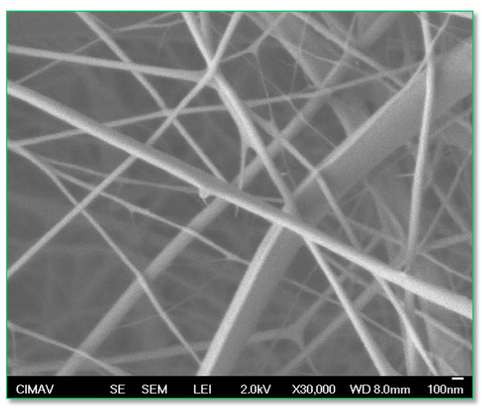
The metallic needle was connected to a high-voltage power supply of 15 kV and a constant flow rate of 0.3 mL/h was used.

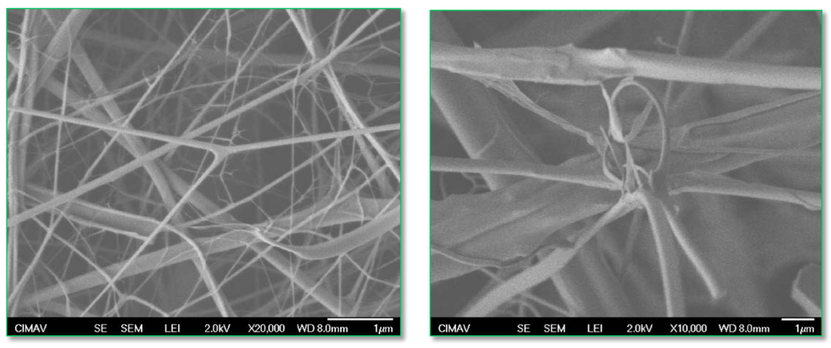
A grounded aluminum foil was placed 13 cm from the needle tip. [2]

CHARACTERIZATION

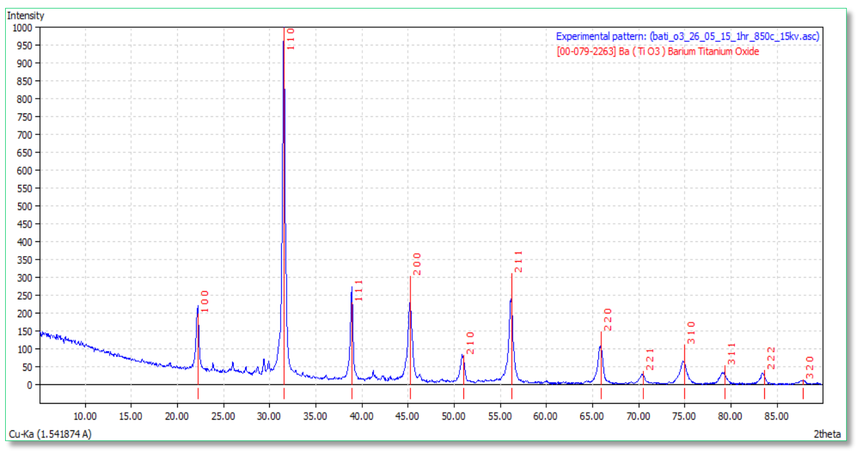


TGA shows that 650 °C is a suitable temperature for calcination of the as-spun fibers.





SEM images of polymeric fibers.

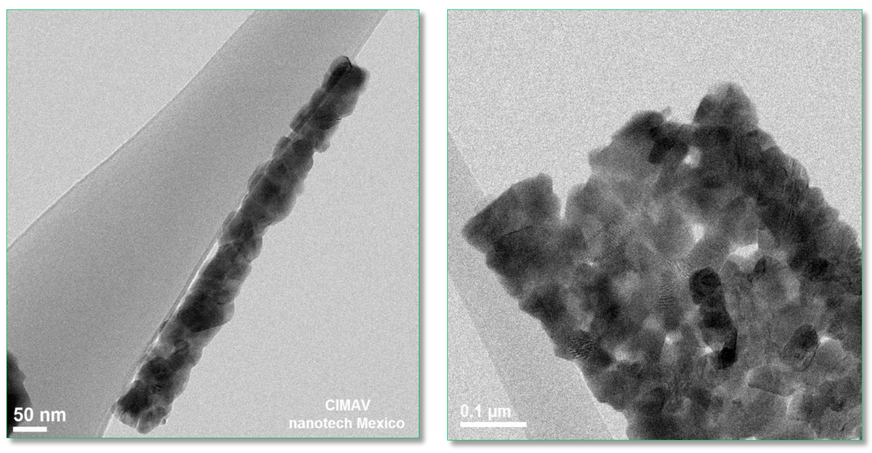


As confirmed by XRD analysis, from 650 °C to 850 °C, the phase of $BaTiO_3$ has been reached.

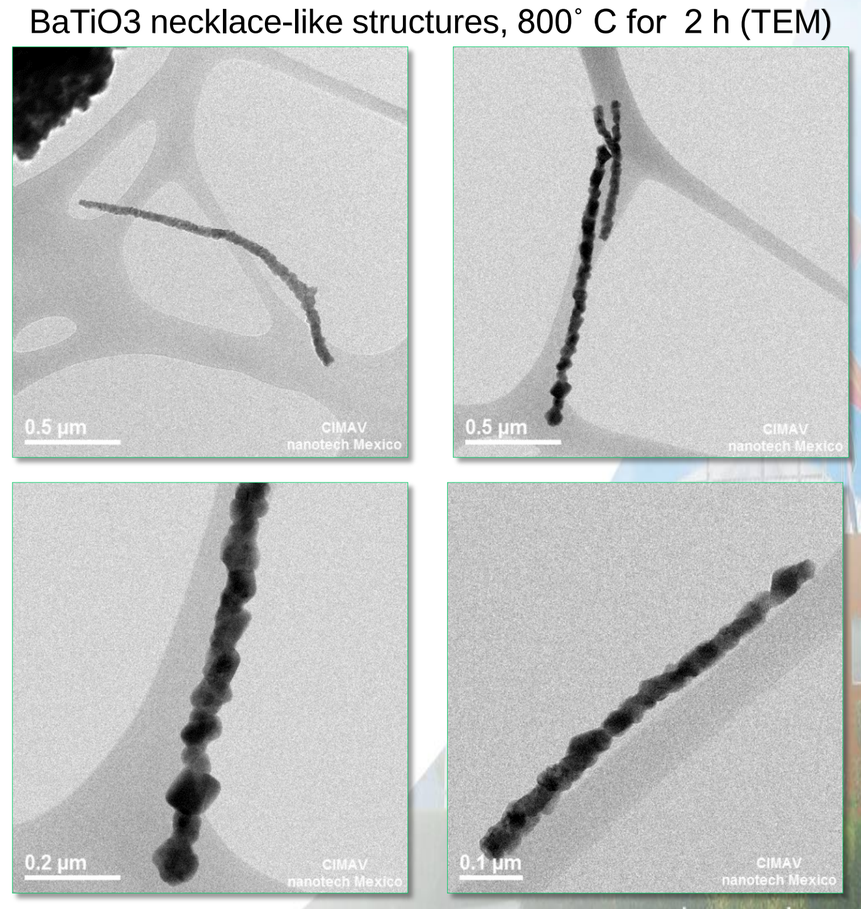
CONCLUSIONS

Nanofibers have been successfully prepared by electrospinning process, followed by calcination at 750 ˚C for 2 h and 850˚ C for 1 h show a length of few µm, formed by irregular shaped nanoparticles with size between 90 and 180 nm.

BaTiO3 necklace-like structures, 850˚ C for 1 h (TEM)



BaTiO3 necklace-like structures, 800˚ C for 2 h (TEM)



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