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(54) Title of the invention : SYSTEM AND METHOD FOR THE SYNTHESIS AND INTEGRATION OF BIFEO<sub>3</sub>-BASED NANOMATERIALS FOR BIOMEDICAL, ELECTRONIC, AND SPINTRONIC APPLICATIONS

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(57) Abstract :

The present invention relates to the development of a unique system and method for the fabrication and integration of nanomaterials based on Bismuth Ferrite (BiFeO<sub>3</sub>), tailored explicitly for the strict requirements of biomedical, electronic, and spintronic applications. The technology utilizes a novel hydrothermal synthesis procedure combined with state-of-the-art pulsed laser deposition to provide exact control over particle size, crystallographic alignment, and surface chemistry. Such an approach efficiently suppresses the formation of second phases while dramatically improving magnetoelectric interaction and bandgap modification. Thus, this method allows for easy integration of these ultra-high purity nanoparticles onto various substrates such as flexible polymers and semiconductors. These materials demonstrate outstanding performance, being integral elements in non-volatile memory chips, large capacitance capacitors, and medical therapy drugs. Therefore, by providing a standardized fabrication process, this technique creates a reliable and economic means for producing multiple BiFeO<sub>3</sub>-based systems for use in future industrial innovations. FIG.1

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