

## Pharmaceutical application of nanocrystalline piezoelectric ceramics

S. Pourianejad<sup>1,\*</sup>, B. Movahedy<sup>1</sup>, F. Karimzadeh<sup>2</sup>

<sup>1</sup>*Department of Nanotechnology Engineering, Faculty of Advanced Sciences and Technologies, University of Isfahan, Isfahan, Iran*

<sup>2</sup>*Department of Materials Engineering, Isfahan University of Technology, Isfahan, Iran*

**Background and Aims:** Recently, piezoelectric ceramics, the smart materials with converting capability of mechanical stress to electrical respond and vice versa, are known as crucial elements in novel pharmaceutical equipments and analyzing devices. From its application can be indicated “needle-free” injection system of insulin by using cymbal piezo-actuators for transdermal drug delivery based on high power ultrasonic. The main purpose of the present study is to obtain a prepare component of (Bi<sub>0.5</sub> Na<sub>0.5</sub>)TiO<sub>3</sub>- (Bi<sub>0.5</sub> K<sub>0.5</sub>)TiO<sub>3</sub>- BaTiO<sub>3</sub> as a lead free piezoelectric nano crystalline ceramic also investigating its properties as a raw material prepare for using in pharmaceutical and medical equipments.

**Methods:** For synthesising nano crystalline piezoelectric ceramics, the modified solid state route has been used.

**Results:** The component of (Bi<sub>0.5</sub> Na<sub>0.5</sub>)TiO<sub>3</sub>- (Bi<sub>0.5</sub> K<sub>0.5</sub>)TiO<sub>3</sub>- BaTiO<sub>3</sub> by mechanical alloying and solid state approach so that the structural phase of perovskite was attained successfully and the piezoelectric properties are being investigated.

**Conclusions:** Produced nano crystalline piezoelectric ceramics with prepare piezoelectric properties as a raw material with an applied fabricating process on it, is the crucial element in ultrasonic instrument for transdermal drug delivery, pharmaceutical analysing and medical equipments.

**Keywords:** Nanocrystalline piezoelectric ceramics; Needle-free injection, Transdermal drug delivery Solid state method