

# **Polymeric piezoelectric actuator substrate for osteoblast mechanical stimulation**

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## **Abstract**

Bone mass distribution and structure are dependent on mechanical stress and adaptive response at cellular and tissue levels. Mechanical stimulation of bone

induces new bone formation in vivo and increases the metabolic activity and gene expression of osteoblasts in culture. A wide variety of devices have been tested for mechanical stimulation of cells and tissues in vitro. The aim of this work was to experimentally validate the possibility to use piezoelectric materials as a mean of mechanical stimulation of bone cells, by converse piezoelectric effect. To estimate the magnitude and the distribution of strain, finite numerical models were applied and the results were complemented with the optical tests (Electronic Speckle Pattern Interferometric Process).

In this work, osteoblasts were grown on the surface of a piezoelectric material, both in static and dynamic conditions at low frequencies, and total protein, cell viability and nitric oxide measurements comparisons are presented.

**KEYWORDS:** Polymeric piezoelectric, actuator, osteoblast cells, mechanical stimulation