

Optimization of Smart Diaphragm Material for Pressure Sensor in Ventilators

M. Algappan¹, P. C.CHAKRAVARTHI¹, R. KEERTHANA¹, S. MANGAYARKARASI¹, A. KANDASWAMY¹

¹PSG College OF Technology, Combatore, Tamil Nadu, India

Abstract

A medical ventilator is an imperative device used to save life by delivering an assortment of air and oxygen into and out of the patients' lungs to administer breathing or to assist obligatory breathing. The commercially available diaphragm based pressure sensors made up of silicon measure the air and oxygen flow. The proposed work utilizes the Piezo electric material for the pressure range implemented in the commercial models designed using Silicon. The piezoelectric materials selected for the sensing application are Lead Zirconate Titanate PZT- 4, 5A and PZT- 8. The structural dimensions with respect to displacement of the diaphragm is theoretically calculated and compared with the simulation models for the PZT materials. The simulation tool used for the analysis is COMSOL Multiphysics® software and the simulation results coincide with the theoretical values. Among the three materials, the PZT-5A shows better displacement and proves its suitability for pressure sensing application.

Reference

1.Mohammadi, V. ; Dept. of Electr. Eng., Shiraz Univ., Shiraz, Iran ; Sheikhi, M.H. ; Torkian, S. ; Barzegar, A. , Design, modeling and optimization of a piezoelectric pressure sensor based on thin-film PZT diaphragm contain of nanocrystalline powders, Mechatronics and its Applications, 2009. ISMA '09. 6th International Symposium, Page(s): 1 - 7

Figures used in the abstract

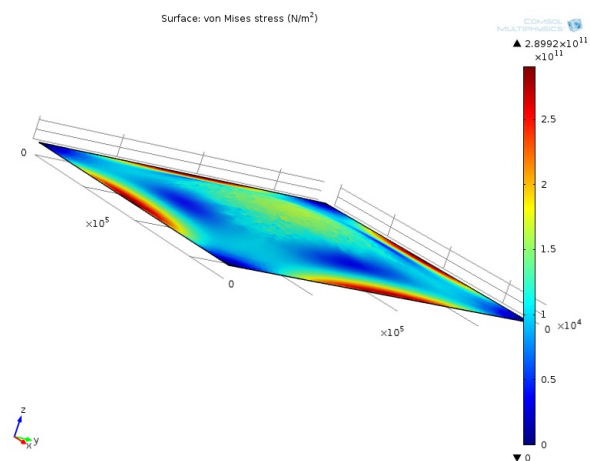


Figure 1: PZT 4- STRESS PLOT

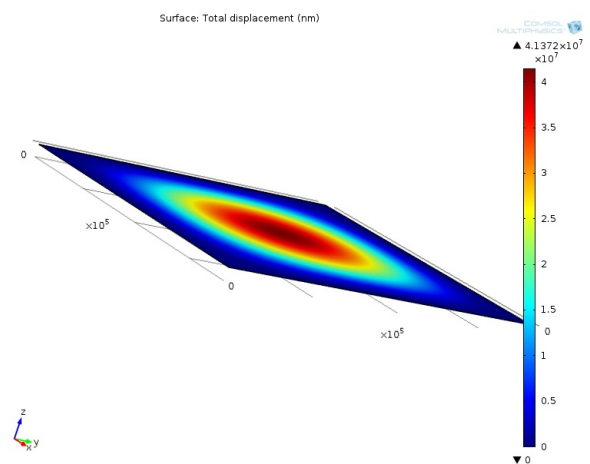


Figure 2: PZT 4-DISPLACEMENT PLOT

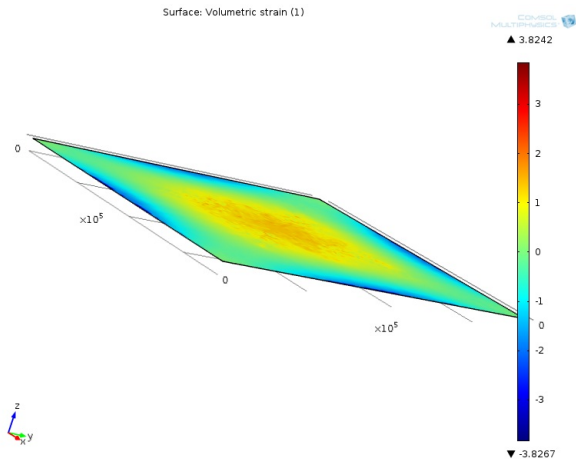


Figure 3: PZT 4- VOLUMETRIC STRAIN