Abstract

The aim of the thesis is to study mechanical properties of nanomaterials (multi-layer graphene, silicon, mica) suitable to be used as novel pressure sensors in laser photoacoustic spectroscopy. Membranes (diameter ~ 4 mm, thickness ~ 100 nm) were prepared by mechanical exfoliation method and then attached to a glass window in several slightly different designs. Movement of these membranes was detected using HeNe laser beam reflected from the membrane´s surface onto a position sensitive detector. Methanol was used as a model gas and the signal was collected from studied element and microphone simultaneously. Acoustic wave, induced inside a measuring cell by periodic thermal variations, causes the membranes to move. The movement of a membrane is influenced by its mechanical properties, which is possible to determine by fitting the measured data into a mathematical model. Comparison of the output data of all membranes´ measurements shows, that the signal intensity is influenced by the method of attaching membrane to a glass window and by volume of free space on a side of a membrane. Metallization of the membrane´s surface (~ 70 nm) decreases its springiness thus decreases the sensitivity. Several membranes reached sensitivity comparable with top class microphone.