SEMICONDUCTOR STRAIN GAGES

Semiconductor strain gages operate on the transduction mechanism known as piezoresistive effect. It is defined as the change in electrical resistivity brought about by an elastic strain field. In some semiconductors the piezoresistive effect is quite large.

Both p-type and n-type silicon are used in the fabrication of these gages. When a semiconductor gage is strained, the distribution of the number of charge carriers and their mobility changes and consequently the resistivity changes. Semiconductor gages also have a gage factor as their figure of merit, which is given by

$$GF = \frac{\Delta R/R}{\Delta L/L} = 1 + 2\mu + \pi_L Y$$

where μ=Poisson's ratio
π_L=longitudinal piezoresistive coefficient
Y=Young's modulus

The first two terms of Eq. 5.8 correspond to dimensional changes similar to wire and foil gages, but the third term is due to piezoresistivity. Also, ∏L is larger than (1+2μ) by a factor of about 100. The magnitude of the gage factor also depends on the direction along which the stress is applied to the semiconductor.

Silicon diaphragms with diffused strain gages are used in miniature pressure transducers.

Source: http://mediatoget.blogspot.in/2012/05/semiconductor-strain-gages.html