LPM

Thick-film sensors

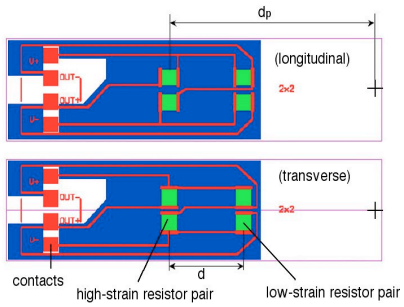
ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

Integration and high-strain response of piezoresistive thick-film resistors on titanium alloy substrates

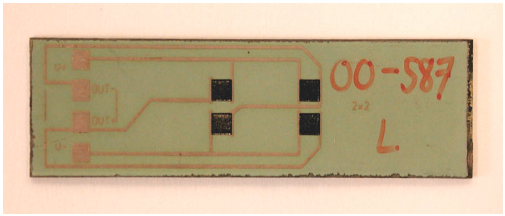
Caroline Jacq, Thomas Maeder and Peter Ryser, Laboratoire de Production Microtechnique

Ecole Polytechnique Fédérale de Lausanne, CH-1015 Lausanne

In order to enhance piezoresisitive response, titanium and titanium alloys have been evaluated as elastic substrates for thick-film force and pressure sensors, and compared to alumina (brittle material) or steel.



Layout of the test cantilever beams



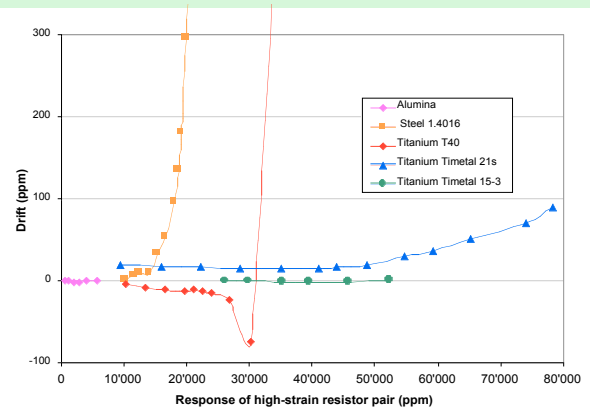
Cantilever beam with four thick-film strain-sensitive resistors configured in a Wheatstone bridge arrangement

Resistors under compression

In order to avoid being limited by mechanical failure of the thick-film layers, the samples were first tested with the measuring resistors under compression.

Titanium alloys allow much higher response compared to alumina (brittle material) and steel (plastic material), owing to a high yield strength and a low elastic modulus, and hence piezoresisitive response in excess of 4%.

T40 titanium (grade 2) gives intermediate results.

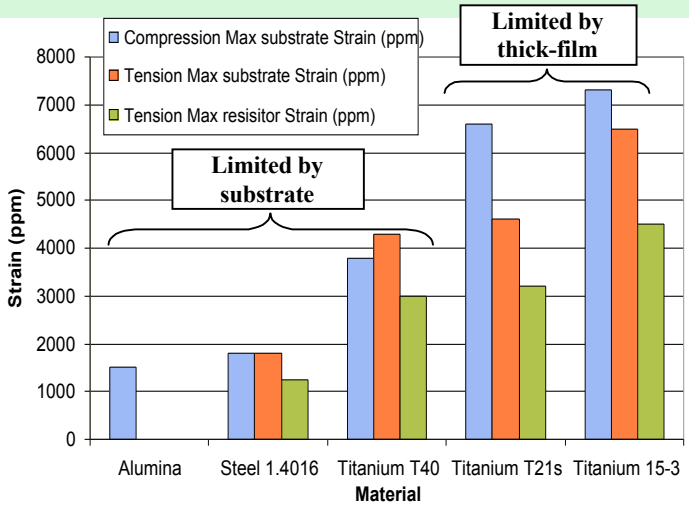


Strain-limiting factor in tension

In tension, maximum signal / strain may also be limited by brittle fracture of the thick-film measuring bridge.

Titanium alloys are very elastic and allow strains of >5'000 ppm. Failure of the thick-films is observed in the 3'200 to 4500 ppm range, and therefore limits the maximum strain.

Sensors on alumina and steel are limited by the substrate.



EPFL - IPR - LPM -
CH - 1015 Lausanne Tél: +41-21-693-3817