Temperature Sensor for Microelectromechanics systems

CSIC and the Slovak University of Technology in Bratislava have developed a sensor device based on composite cylindrical systems formed by a number of layers out of different materials. That confers such microwires the combination of excellent magnetic and mechanical properties with outstanding technological possibilities by their capability to be employed in magneto-electro-mechanical sensors. The main advantage is the sensitive and fast measurement of temperature.

Industrial partners to develop and exploit this technology are sought.

Temperature sensor

Recently, the study and development of micro electromechanical systems, MEMS, is receiving much attention. The main advantage is the ease of control thermal expansion within the elastic range in alloys by subjecting the sample to externally heating process.

The temperature sensor developed exhibits cylindrical symmetry with micrometric total diameter consisting of several layers with metallic or insulating electrical behavior (see Figure 1) characterized by a different thermal expansion coefficient and radial asymmetry in any of their transverse section. The metallic layers can present also ferromagnetic behavior.

The sensor is based on the effect produced by the flowing of electrical current, controlled in amplitude and frequency, along the microwire.

On one hand, periodical bending strain arise as a consequence of the differential thermal expansion coefficient of element layers. Such mechanical response is largely determined by the strong specific mechanical stresses induced during respective fabrication process for each layer. On the other hand, DC current flow results in a proportional temperature increment.

The sensor presents two alternative electrical connections, where either both ends of the microwires are connected to fixed electrical contacts or one of the connect is mobile.

The sensor offers new opportunities for novel microactuators, artificial muscle in robotics, control flow valves in refrigeration systems or novel magneto-mechanical systems.

Advantages and Innovative issue

- Limited low-cost of fabrication.
- Reduced size (5 to 10 mm length and 20-40 micron diameter) and robustness of sensor microwire.
- Measuring temperature regime can be tailored through electrical current and layer components.
- Quickness in time response.

Patent status

Patent submitted

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