Léonar Savine
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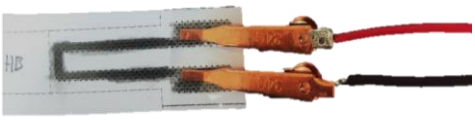
Graphite Flex Sensor



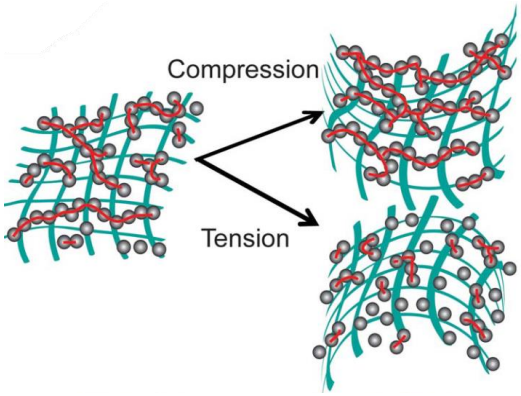
Main Features

- Low-tech
- Low cost
- Light weight
- Easy to use

General description

This new and innovative sensor, made in the department of physics of INSA as a part of the curriculum is based on the publication *Pencil Drawn Strain Gauges and Chemiresistors on Paper*[1]. It is composed of a piece of paper on which a layer of graphite has been deposit using a pencil.

The graphite added with the pencil allow the electron to move from particles to particle through tunnel effect. This effect being very sensitive to distance any movement of the particle will affect the movement of the electrons, if the particles are closer the movement of the electron is facilitated. This means that stretching or compression the graphite will change the resistivity of the sensor.

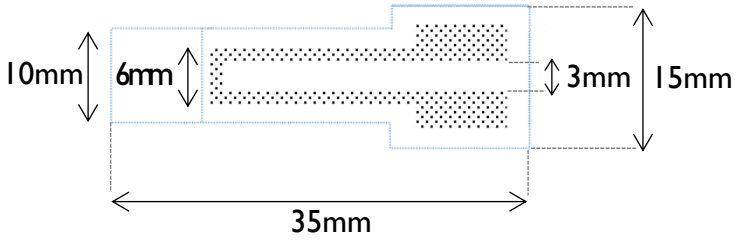


The variation of resistivity of the graphite when deformed is used to make a strain sensor.

Specifications

Type	Strain sensor
Materials	- Paper - Graphite
Graphite compatibility	B, HB
Sensor	Passive
Output signal	Analog
Measurand	Resistance
Typical response time	>100ms

Structure and Dimensions



[1] Lin, C.-W., Zhao, Z., Kim, J. & Huang, J. *Pencil Drawn Strain Gauges and Chemiresistors on Paper*. Sci. Rep. 4, 3812; DOI:10.1038/srep03812 (2014).

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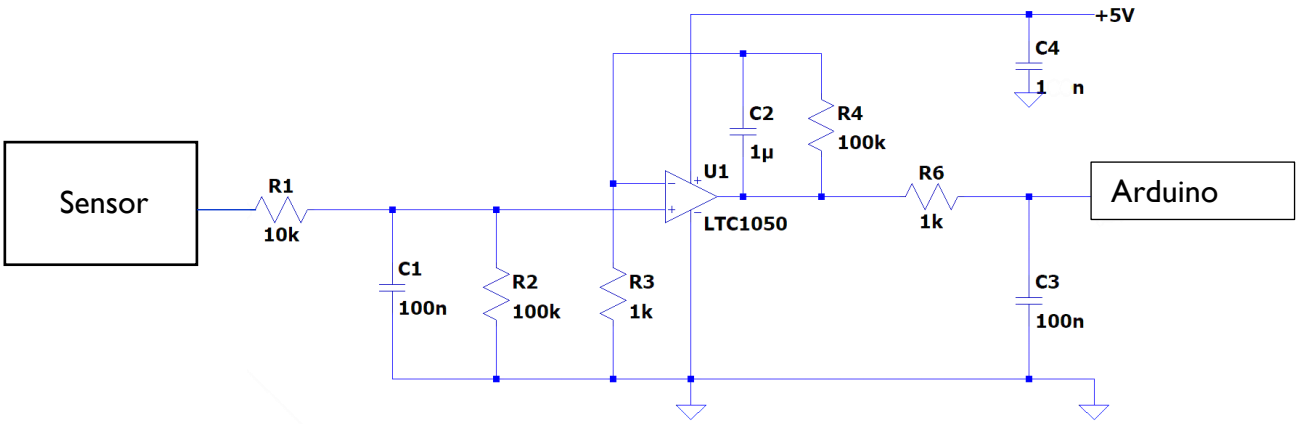
Electrical characteristics

		Compression			Extension		
	Units	Min	Typ	Max	Min	Typ	Max
Voltage	V	-	5	-	-	5	-
Resistivity B	MΩ	45	60	80	40	50	70
Resistivity HB	MΩ	350	600	900	300	350	500

Example of integration

Below is an example of integration circuit used to interface the strain sensor with an Arduino.



We use a transimpedance amplifier circuit to filter and amplify the signal from the sensor. The resistors R1 and R2 with the capacity C1 allow us to filter le current noise. In the same way, there is a low-pas RC filter after the amplifier in order to reduce the noise.

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Characteristics graphs of resistance in standard test conditions