THERMAL ENERGY DOMAIN

- **The seebeck effect is the build up of an electric potential across a temperature gradient.**

- **A thermocouple measures the difference in potential across a hot and cold end for two dissimilar materials.**

- **This potential difference is proportional to the temperature difference between the hot and cold ends.**

- **It was observed that a compass needle would be deflected by a closed loop formed by two different metals joined in two places, with an applied temperature difference between the joints.**

- **This was because the electron energy levels shifted differently in the different metals, creating a potential difference between the junctions which in turn created an electrical current through the wires, and therefore a magnetic field around the wires.**

- **When an electric current is passed through a circuit of a thermocouple, heat is evolved at one junction and absorbed at the other junction. This is known as the peltier effect.**

- **The peltier effect is the presence of heating or cooling at an electrified junction of two different conductors and is named after french physicist jean charles athanase peltier, who discovered it in 1834.**

- **When a current is made to flow through a junction between two conductors, a and b, heat may be generated or removed at the junction.**

- **The peltier effect can be considered as the back-action counterpart to the seebeck effect (analogous to the back-emf in magnetic induction):**

- **If a simple thermoelectric circuit is closed, then the seebeck effect will drive a current, which in turn (by the peltier effect) will always transfer heat from the hot to the cold junction.**

- **THERMORESISTANCE**
- **IT IS AN COMBINATION OF TWO WORDS THERMAL AND RESISTANCE.**
- **IT MEANS RESISTANCE TO HEAT ENERGY.**
- **THIS IS NORMALLY FOUND IN THEMOCOUPLES.**

- **Resistance thermometers, also called resistance temperature detectors (RTDs), are sensors used to measure temperature.**

- **Many RTD elements consist of a length of fine wire wrapped around a ceramic or glass core but other constructions are also used.**

- **The RTD wire is a pure material, typically platinum, nickel, or copper.**

- **The material has an accurate resistance/temperature relationship which is used to provide an indication of temperature.**

- **As RTD elements are fragile, they are often housed in protective probes.**

- **RTDs, which have higher accuracy and repeatability, are slowly replacing thermocouples in industrial applications below 600 °C**

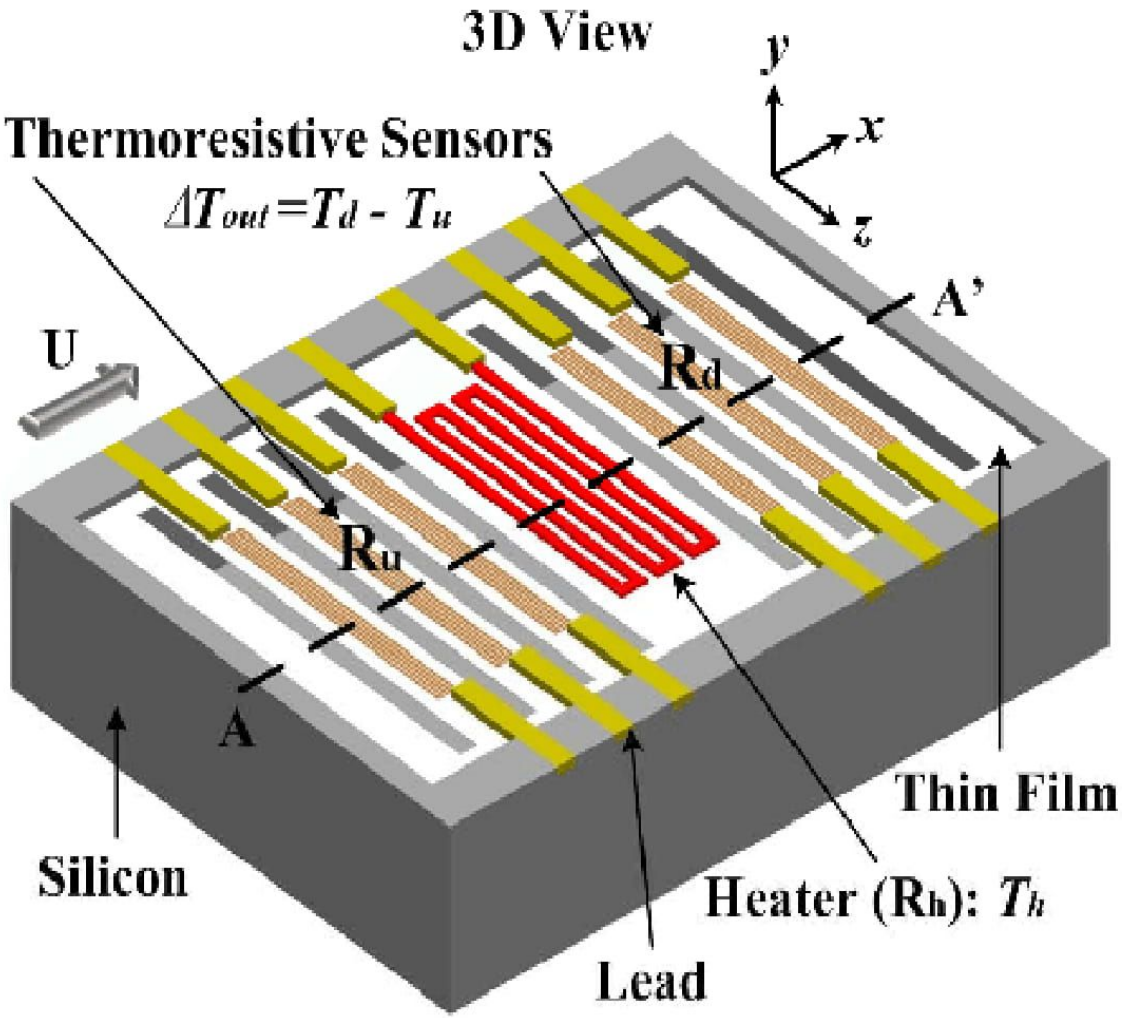
- **Thermomechanical analysis (TMA) is a technique used in thermal analysis, a branch of materials science which studies the properties of materials as they change with temperature.**

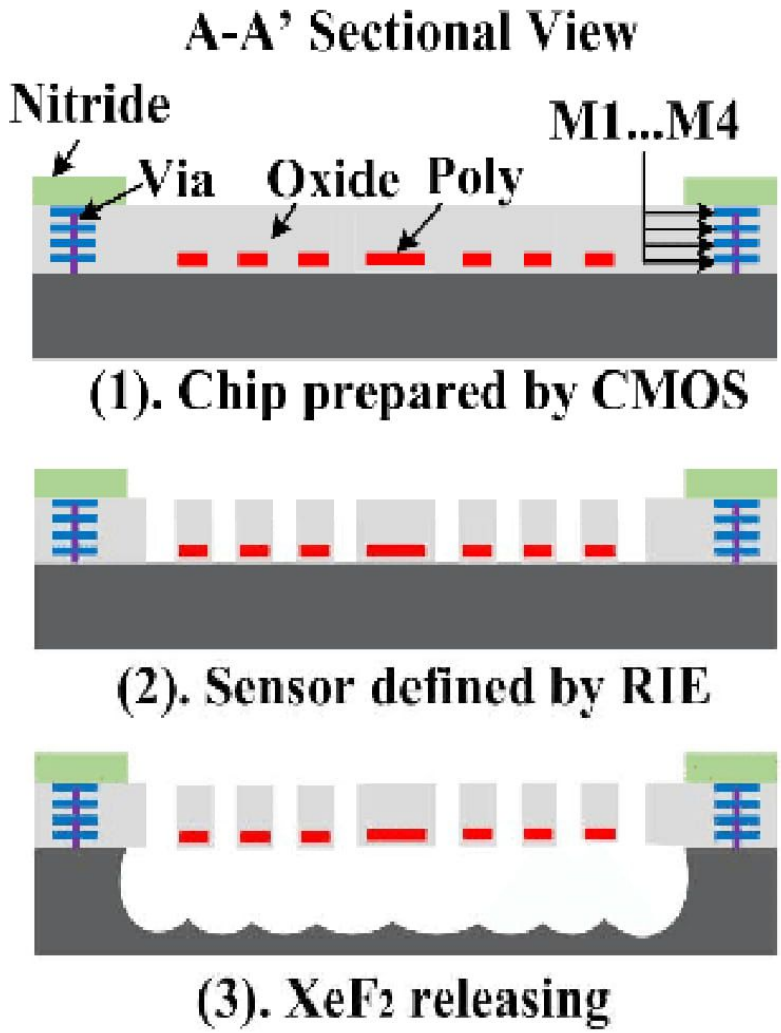
- **Thermomechanometry is the measurement of a change of a dimension or a mechanical property of the sample while it is subjected to a temperature regime.**

- **An associated thermoanalytical method is thermomechanical analysis. A special related technique is thermodilatometry (TD), the measurement of a change of a dimension of the sample with a negligible force acting on the sample while it is subjected to a temperature regime.**

- **The associated thermoanalytical method is thermodilatometric analysis (TDA).**

THERMORESISTIVE MICRO SENSOR





- **A bolometer consists of an absorptive element, such as a thin layer of metal, connected to a thermal reservoir (a body of constant temperature) through a thermal link.**

- **The result is that any radiation impinging on the absorptive element raises its temperature above that of the reservoir – the greater the absorbed power, the higher the temperature.**

- **The intrinsic thermal time constant, which sets the speed of the detector, is equal to the ratio of the heat capacity of the absorptive element to the thermal conductance between the absorptive element and the reservoir.**

- **The temperature change can be measured directly with an attached resistive thermometer, or the resistance of the absorptive element itself can be used as a thermometer. Metal bolometers usually work without cooling.**

- **They are produced from thin foils or metal films. Today, most bolometers use semiconductor or superconductor absorptive elements rather than metals.**

- **These devices can be operated at cryogenic temperatures,**

- **A thermopile is an electronic device that converts thermal energy into electrical energy[It is composed of several thermocouples connected usually in series or, less commonly, in parallel.**

- **Such a device works on the principle of the thermoelectric effect, i.e., generating a voltage when its dissimilar metals (thermocouples) are exposed to a temperature difference .**

- **Thermocouples operate by measuring the temperature differential from their junction point to the point in which the thermocouple output voltage is measured.**

- **Once a closed circuit is made up of more than one metal and there is a difference in temperature between junctions and points of transition from one metal to another, a current is produced as if generated by a difference of potential between the hot and cold junction**