TWO-SENSOR SYSTEM FOR ABSOLUTE AGE & TEMPERATURE HISTORY

US Pat. No.: 9,182,436
Technology Readiness Level: 3
The basic concepts have been demonstrated analytically

Numerous commercial and military applications require knowing the absolute age and/or temperature history of a device or system starting from the time it is assembled or commissioned. Ideally this information could be obtained simply and without power. The Sandia-developed age and temperature history sensor is a physical materials system solution to address this need.

Sandia's passive sensor is based on diffusion of one metal into another, or into a semiconductor, as a function of time and temperature. This new technology leverages two similar sensors with different activation energies, as illustrated in Figure 1 of the attached market sheet. Sensors can be conductive, capacitive, optical, visual or crystalline. Devices can be created using standard metal deposition techniques on common semiconductor and micro-device substrates, including sputter coating, chemical vapor deposition and electrochemical methods.

Figure 1. Schematic of two-component age sensor
Examples: M_1=gold M_2=tungsten

TECHNICAL BENEFITS

- Does not require power during the aging period
- Can determine absolute age independently of temperature history
- Suitable for emplacement on circuit boards

INDUSTRIES & APPLICATIONS

- Removal/replacement of systems exposed to extreme environments
- Verification/invalidation of warranty claims

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