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## Inventors

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## Non-Volatile Timing Device

Timing devices are important for a variety of applications, ranging from defense technologies to consumer electronics. Solid state timers are a popular option, but are volatile, meaning that they do not retain their state during a loss of power. Additionally, many timers are susceptible to interference or damage from radiation. This prevents the timers from being used in products that involve nuclear material in military, energy, or medical applications. Therefore, there is a need for a timing device that retains its state in the absence of power and is resistant to radiation.

Researchers at Arizona State University have invented a non-volatile timing device. The timer operates according to changes in electrical parameters caused by the controlled growth of a conductive metallic electrodeposit. The electrodeposit is persistent and so the timing function is non-volatile, such that the state of the timer is preserved if the system is powered-down. The length of the electrodeposit alters the resistance and capacitance of the structure. Since it grows at a rate that is determined by the magnitude of the current supplied to the device, the effect can be used for timing purposes.

### Potential Applications

- Weapon fuses
- Integrated circuits
- Timers in electronic systems

### Benefits and Advantages

- Non-volatile – Retains state even when system power is removed.
- Efficient – Operates at low voltage and low current.
- Lower cost – Simple structure and no expensive materials.
- Readily integrated – Uses materials that are compatible with integrated circuits and can be fabricated in the back end of line without significant additional circuitry.
- Runtime monitor – Only times when power is applied and therefore can be used as an operational “odometer”.
- Anti-tamper function – Resetting/roll-back may be detected via reverse growth.
- Radiation hard – Materials and growth processes are not affected by radiation so device can be used in military, nuclear, or medical applications.

For more information about the inventor(s) and their research, please see

[Dr. Michael Kozicki's directory webpage](#)

