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Nanothermite based anti-tampering technology

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Security has become a vital part of electronic products that have been employed in critical data storage (personal, bank, etc) or critical equipment such as military systems. They not only handle sensitive data in uncontrolled environments, but also face intellectual protection issues or counterfeiting issues. Unfortunately, all current anti-tampering technologies, while being effective are susceptible to be cracked or bypassed, leaving the system vulnerable. That is why an ultimate action must be considered upon the detection of intrusion through irreversible destruction of the component being attacked. We developed a triggerable ultimate security device capable of physically destroying a memory chip that contains classified data, within a few milliseconds, upon the detection of intrusion. The developed device [1-2] is designed as an add-on module that can be positioned on any electronic chips, IC-circuit, or memory cards, without requiring any specialized chip design, substrate type or encapsulation solution. Its operation is simply based on the exothermic reaction of a solid-state printed energetic composite that physically disintegrate the sensible component in less than 1 ms. The solid-state energetic composite consists of a mixture of Al/CuO nanothermite with a copper ammine complex densely printed onto the chip that is meant to be destroyed. This energetic layer can be ignited through capacitance discharge in less than 50 μ s. The poster details the fabrication of the device and demonstrates that 400 mg of energetic composite irreversibly destroys one silicon chips ($\sim 120 \text{ mm}^3$) in less than 10 ms.

(1) F Sevely, T Wu, FSF de Sousa, L Segulier, V Brossa, S Charlot, A Esteve, C Rossi, Developing a highly responsive miniaturized security device based on a printed copper ammine energetic composite, *Sensors and Actuators A: Physical* **2022**, 346.

(2) G Lahiner, A Nicollet, J Zapata, L Marín, N Richard, M Djafari-Rouhani, C Ross, A Estève, A diffusion–reaction scheme for modeling ignition and self-propagating reactions in Al/CuO multilayered thin films, *Journal of Applied Physics* **2017**, 122 (15).