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Materials Enabling a Magnetic "Midas Touch"

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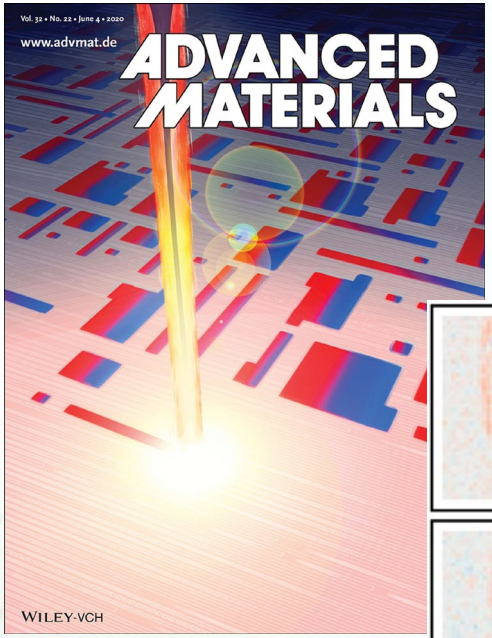
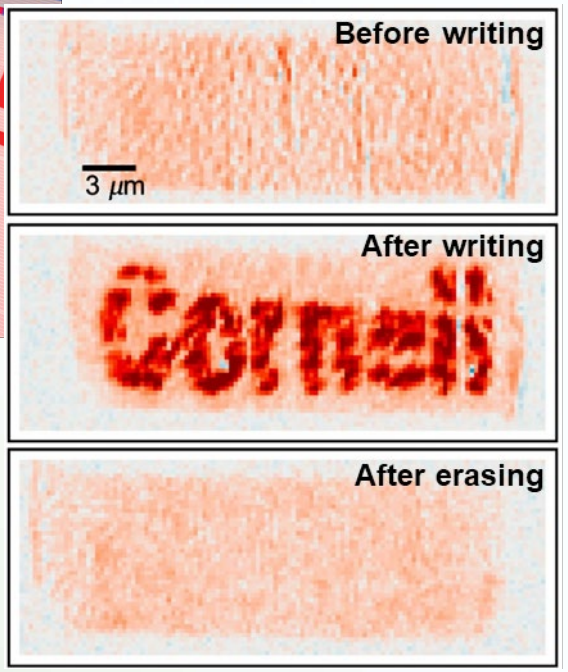
Imagine touching a non-magnetic material and everywhere you touched became magnetic and remained so forever. Such a magnetic Midas touch has become a reality thanks to PARADIM. All that is needed to turn on the magnetism is a brief pulse of heat. A local temperature change of 50-100°C is sufficient to switch the material into a ferromagnetic state, and it remains in that state after cooling back to room temperature. The human finger isn't quite hot enough to accomplish this, but a laser beam is. With a laser, PARADIM users wrote "Cornell." Further, the pattern can be erased by cooling it below room temperature. This ability to controllably write, erase, and rewrite magnetic patterns in an otherwise non-magnetic material is the basis for magnetic data storage, logic devices, and other applications.

The material allowing this is a precise alloy of iron and rhodium ($Fe_{0.52}Rh_{0.48}$) grown as a thin film in PARADIM. The creation of artificial patterns provides an exciting platform to study magnetic interactions in any configuration and to explore the functionality of novel magnetic devices.



Cartoon of the writing process by local heating with a focused laser beam (selected as inside cover).



Magnetization measured at room temperature of a sample before and after writing and after full erasure of all letters by cooling. Color represents the magnetization strength.

A.B. Mei *et al.*, *Adv. Mater.* **32**, 2001080 (2020).