

Ensuring FORC future: how to avoid being only the flavor of the month

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Like all characterization techniques, the first-order reversal curve (FORC) method arose from a particular need encountered by researchers. However, experimental approaches follow a life cycle, similar to scientific theories. Epistemologists taught the scientific community that a novel theory development is followed by a period of “normal science”. It ends when new phenomena that do not fit in the actual paradigm are observed, thus requiring a completely different vision to explain those.

Looking to the past, FORC method seems to exhibit a 15 years life cycle period. It is been around 30 years ago that Mayergoyz published his seminal work on first-order reversal curves measurements [1]. This innovative tool fulfilled an unattended requirement, which was to be able to recover the system parameters, according to the classical Preisach model. It satisfied its (few) pioneer users during 15 years, until the problem that most magnetic systems cannot be described by this model required a new paradigm to ensure the FORC technique usefulness. The paradigm shift occurred just before year 2000, with Pike’s response of using the FORC diagram as a fingerprint of the system [2].

It is been now 15 other years, during which the FORC method use greatly expanded, in all aspects. From a small initial community, with home-made acquisition and calculation programs, it grew as a now commonly available technique, with dedicated softwares. The kind of investigated systems passed from “entities collection” to a pretty wide variety. FORCs acquisition is not anymore limited to magnetostatic curves, mainly from VSM. The protocol was extended to other variables, such as resistance, temperature, etc.

Those improvements greatly helped the FORC technique development and turned it as a “fashionable” tool. However, adequate and accurate FORC results analysis represents a fundamental point for its use and is still an ongoing study. Unfortunately, the technique has been a victim of its own success, leading to a large number of studies with incorrect interpretation, but that are now part of the FORC literature. As a consequence, several researchers became doubtful about the technique real possibilities.

Therefore, after being a scarcely used technique and then a flavor of the month, it seems that the FORC method requires a new paradigm to ensure its perpetuity. The exact form of this new vision/use has yet to be defined, but represents the opportunity to turn the FORC technique as a “mature” characterization technique.

[1] I. D. Mayergoyz, *J. Appl. Phys.* **57**, 3803 (1985)

[2] C. R. Pike, A. P. Roberts, and K. L. Verosub, *J. Appl. Phys.* **85**, 6660 (1999).