Changes in Domain Structure on $\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$ (LSMO)
Nanosurf® easyPLL series Application Note

The LSMO manganese perovskites with their colossal magnetoressistivity at room temperature offer a magnificent opportunity to observe the motion of magnetic domain walls by means of magnetic force microscopy. Researchers at universities in Germany and South Korea teamed up to measure the image displayed to the right. The image shows the characteristic labyrinthine growth of magnetic domains by means of domain wall motion which occurs in preference at the domain ends. To obtain this image, the researchers grew a layer of LSMO epitaxially on LaAlO$_3$ via pulsed laser deposition and subsequent healing at a higher partial oxygen pressure. By sputtering Ar ions at it to remove the native oxide layer, then vapor depositing a layer of Fe of roughly 5 nm, the silicon cantilever was prepared. The researchers measured the frequency shift of that sensor, oscillating it in a vacuum with a constant amplitude of 5 nm, and keeping it at a constant height of typically 20 nm by subtracting the base plane, compensating the mean contact potential difference, and switching off the z-feedback loop. The frequency shift was detected with a Nanosurf easyPLL working in conjunction with RHK control electronics and a custom-built microscope.

Image credits:
A. Schwarz$^1$, M. Liebmann$^{1(4)}$, U. Kaiser$^1$, R. Wiesendanger$^1$, U. H. Pi$^{2(5)}$, D. H. Kim$^3$, Z. G. Khim$^2$, T. W. Noh$^2$, D. W. Kim$^{2(6)}$ ($^1$IAP, University of Hamburg, Germany; $^2$Seoul National University, South Korea; $^3$Yeungnam University, South Korea; $^4$now at Yale University, USA; $^5$now at ETRI, Daejon, South Korea; $^6$now at SAIST, Suwon, South Korea)

Further reading:
M. Liebmann et al., J. Appl. Phys. 93, 8319 (2003); "Domain nucleation and growth of $\text{La}_{0.7}\text{Ca}_{0.3}\text{MnO}_3$-$\text{LaAlO}_3$ films studied by low temperature magnetic force microscopy"

A. Schwarz et al., Phys. Rev. Lett. 92, 77206 (2004); "Visualization of the Barkhausen Effect by Magnetic Force Microscopy"