



# Nanomagnetism and Spintronics: 4. Dynamics of Magnetic Domain Walls in Nanomagnetic Systems

*Teruo Ono, Teruya Shinjo*

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## **Nanomagnetism and Spintronics: 4. Dynamics of Magnetic Domain Walls in Nanomagnetic Systems**

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Dynamical behavior of magnetic domain wall (DW) is one of the main issues in the field of spintronics. In this chapter, several experimental studies in DW dynamics in nanomagnetic systems are described. For the study of DW motion in nanoscale wires, samples with a trilayer structure, ferromagnetic/nonmagnetic/ferromagnetic, were prepared and the position of DW was estimated from electrical resistance measurements using giant magnetoresistance principle. The velocity of DW driven by an external field has been evaluated from the resistance change. On the other hand, current-driven DW motion in a single wire of ferromagnetic layer was studied by magnetic force microscopy (MFM). All-electrical control and local detection of multiple magnetic DWs are also shown. Magnetic vortex structures are realized in nanoscale ferromagnetic dot systems. The behavior of vortex core magnetization was observed by MFM. Recent topics such as the switching of vortex core driven by a high frequency AC are introduced. Furthermore, all-electrical operation of a magnetic vortex core memory cell is demonstrated.

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