구두발표 III-2

Modeling of Hysteresis Curve and Magnetization Configuration of Deep-submicron $Ni_{80}Fe_{20}$ Elements with Various Shapes

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Micromagnetic computer simulation can lead to a deep understanding of magnetic hysteresis loops and magnetization configuration of nanoscale or submicron magnetic elements by visualization of the magnetization reversal process. We performed micromagnetic computer simulations on deep-submicron Permalloy elements with various shapes to visualize switching processes and to investigate element shape dependence of the astroid curves. The shapes studied in this paper include Saturn, ellipse, Pac-man (PM) and elongated Pac-man (EPM). The simulation results show the Saturn shape having the smallest coercivity but with high switching field distribution. Compared to the Saturn shape, the PM shape has the advantage of fast switching and narrow switching distribution. The switching of the PM element involves a fast coherent process compared to the Saturn shape. The MRAM device operating window of the elongated PM shape is larger than the Saturn shaped element. Simulated hysteresis loops and astroid curves of the various shapes are presented. It is concluded that the PM shape has advantages over the other shapes for use in MRAM and magnetic sensor applications.