

Nanodomain manipulation for ultrahigh density ferroelectric data storage

Yasuo Cho *et al* 2006 *Nanotechnology* **17** S137-S141 doi:10.1088/0957-4484/17/7/S06

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Abstract. Nanosized inverted domain dots in ferroelectric materials have potential application in ultrahigh density rewritable data storage systems. Herein, a data storage system is presented based on scanning non-linear dielectric microscopy and a thin film of ferroelectric single-crystal lithium tantalite. Through domain engineering, we succeeded in forming our smallest artificial nanodomain single dot at 5.1 nm diameter and an artificial nanodomain dot array with a memory density of 10.1 Tbit inch⁻² and a bit spacing of 8.0 nm, representing the highest memory density for rewritable data storage reported to date. Subnanosecond (500 ps) domain switching speed has also been achieved. Next, actual information storage with a low bit error and high memory density was performed. A bit error ratio of less than 1×10^{-4} was achieved at an areal density of 258 Gbit inch⁻². Moreover, actual information storage is demonstrated at a density of 1 Tbit inch⁻².

Print publication: Issue 7 (14 April 2006)

Received 11 August 2005, in final form 26 September 2005

Published 10 March 2006