Directed Block Copolymer Assembly to 4 Teradot/in$^2$ Patterned Media: Chemical or Topographic Guiding?

S. Xiao, X. M. Yang, K. Y. Lee, and D. Weller
*Seagate Technology, 47010 Kato Road, Fremont, CA 94538*

State-of-the-art top-down patterning methods are not sufficient for the fabrication of ultrahigh-density patterned magnetic media, which requires a lithographic resolution beyond 1 Tdot/in$^2$. Bottom-up technologies utilizing self-assembling materials, like block copolymers (BCPs), on the other hand, must meet two major challenges to generate addressable arrays for patterned media: (1) addressability over arbitrarily large areas, and (2) resolution extendible to the 1-2 Tdot/in$^2$ or sub-10 nm half pitch regimes. Chemically or topographically patterned substrates have been used to induce well-aligned lamellar or cylindrical microdomains oriented normal to the film surface in BCPs over macroscopic area, but the resolution scalability, i.e. the ratio between the period of the surface pattern and that of the BCP, and the extension to higher areal densities has yet to be optimized. By combining BCP in the strong segregation limit with either chemically or topographically patterned surfaces, we show that directed self-assembled addressable dot arrays with an areal density of 1.3-3.8 Tdot/in$^2$ can be easily achieved with a resolution scalability of a factor of 4 (Fig. 1). This approach has immediate application in fabricating patterned media with areal densities of 4 Tdot/in$^2$ and can be extended to much higher densities. Besides, some issues about integrating block copolymer lithography into patterned media template fabrication will also be addressed.

*Email: shuaigang.xiao@seagate.com

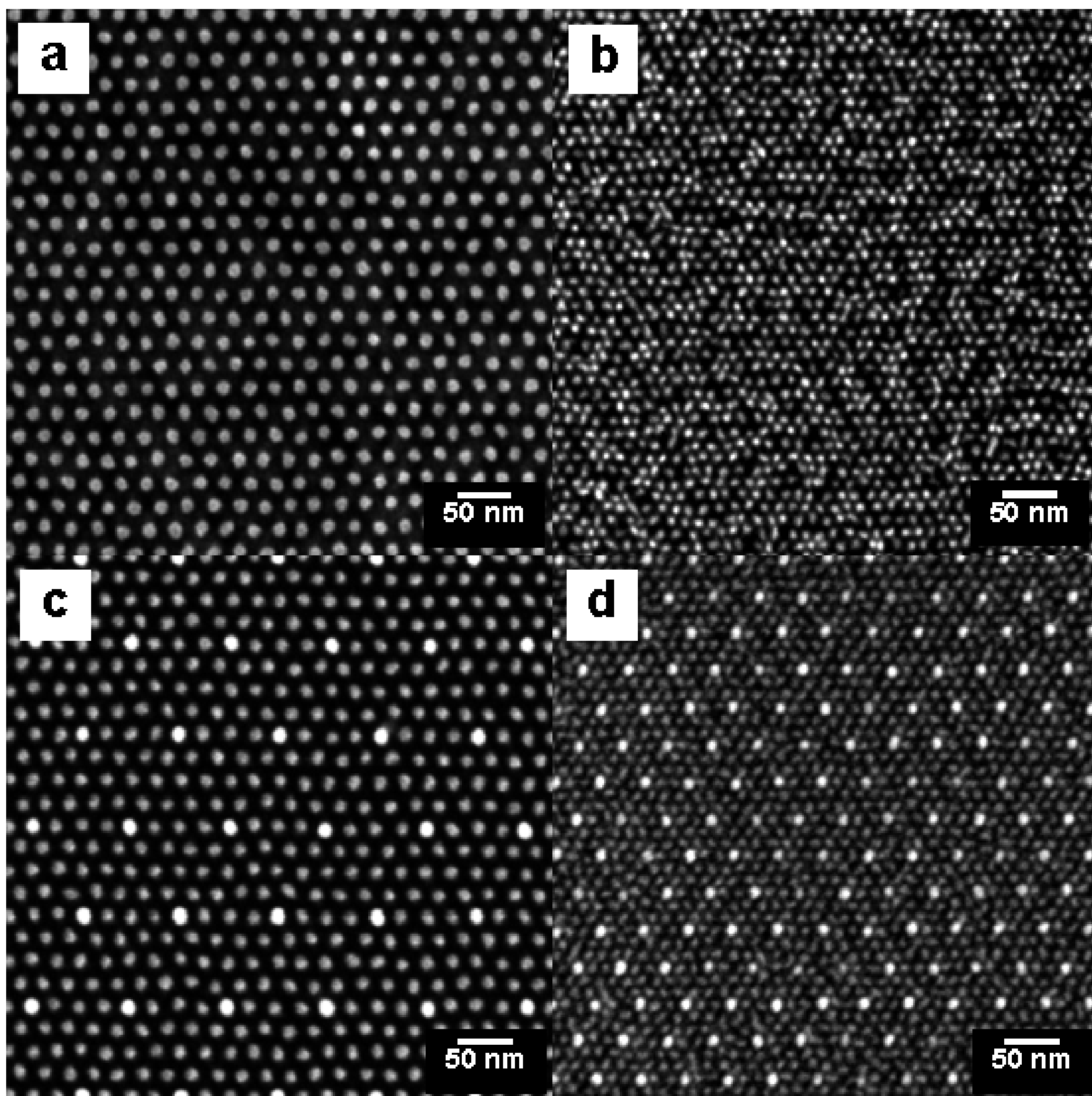


*Fig 1:* Addressable block copolymer nanodomains: (a) 1.3 Tdot/in$^2$ and (b) 3.8 Tdot/in$^2$ guided by surface chemical patterns; (c) 1.3 Tdot/in$^2$ and (d) 3.8 Tdot/in$^2$ guided by surface topographic patterns.