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Cryogenic Etching for Sub-10 nm Patterning for Bit Patterned Media Fabrication

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Bit patterned media (BPM) is pushing the limits of lithography and plasma etching. In the next 10 years, sub- 10 nm pitch lithography and pattern transfer are required to reach bit densities approaching 10 TB/in^2. For high throughput manufacturing, nanoimprint lithography will be utilized to pattern the disks. Here, I will discuss low-temperature plasma etching for high-resolution nanoimprint template fabrication using block copolymer lithography and double patterning technologies. The template manufacturing process depends on a multitude of plasma etching steps culminating in quartz etching. Initial dimensions will be determined by the capabilities of block copolymer lithography while the ultimate dimensions will be defined using either double or quadruple patterning. Four to seven plasma etching steps will be required to produce the final template. I will discuss our investigations of cryogenic etching processing for BPM template fabrication. Benefits of cryogenic etching can include enhanced selectivity, better profile control, and novel passivant formation. I will cover applicability of cryoetching in silicon, silicon dioxide, carbon based materials, and chromium.