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Computational Optimization of Magnetically Enhanced CCP Plasma Uniformity for Disk Etch Applications VLADIMIR KUDRIAVTSEV, WENLI COLLISON, HUONG NGUYEN, PAT WARD, MICHAEL BARNES, Intevac, MARK KUSHNER, University of Michigan — Discrete track recording (DTR) is currently the most perspective way of nanomanufacturing of hard disk magnetic media. Using lithography and plasma etch steps it forms patterned narrow gaps. In this study we optimize magnetron plasma chamber uniformity to enable optimal plasma etch process. We have utilized HPEM plasma model to investigate CF4 capacitively coupled single frequency plasma enhanced with static magnetic field, and analyze radial plasma uniformity near disk surface. Results will be discussed for the spatial dependence of plasma density, ion and radical fluxes (CFx, F) as a function of chamber height, electrode to magnet distance and overall strength of magnetic field. Plasma density distribution and shape of visible plasma emissions are largely controlled by the shape of magnetic field lines. We were able to show in this study that full plasma model is required and use of only of the static magnetic field model is grossly insufficient and can lead to incorrect results. Through the use of computational model we have found optimal combination of governing parameters that control plasma uniformity across the disk, which was improved from 26% down to 4%. Using these parameters production plasma etch chamber was build and experimental studies further confirmed computational results.

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