High Density Plasma Etching of Magnetic Multi-layers of NiFe/Co and NiFe/Al-O/Co

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A parametric study of dry etching of NiFe(30 nm)/Co(30 nm) and NiFe(30 nm)/Al-O(2 nm)/Co(30 nm) films by inductively coupled plasmas (ICPs) using Cl_2/Ar has been carried out in terms of etch rate, etch profile, and surface morphology, respectively. The etch rates of NiFe(30 nm)/Co(30 nm) and NiFe(30 nm)/Al-O(2 nm)/Co(30 nm) increased with the rf chuck power, and increased linearly with the Cl_2 concentration up to 75 %, but decreased above 75 % Cl_2. Also, the etch rates and profile of etched magnetic multi-layers were affected by the ICP source power and the operating pressure. The optimum etch conditions of the magnetic multi-layers, resulting in a good etch profile without deformation of photo-resist, were ICP source power of 700 W, rf chuck power of 150 W, operating pressure of 5 mTorr, and Cl_2 concentration of 25%, respectively. Good pattern transfer of a submicron structure of the magnetic multi-layers was able to be obtained at the optimum conditions.