

Docket No.: 2390.P1

ABSTRACT OF THE DISCLOSURE

HIGH DENSITY PLASMA SOURCE FOR IONIZED METAL DEPOSITION

A magnetron especially advantageous for low-pressure plasma sputtering or sustained self-sputtering having reduced area but full target coverage. The magnetron includes an outer pole face surrounding an inner pole face with a gap therebetween. The outer pole of the magnetron of the invention is smaller than that of a circular magnetron similarly extending from the center to the periphery of the target. Different shapes include a racetrack, an ellipse, an egg shape, a triangle, and a triangle with an arc conforming to the target periphery. The small shape allows high power densities to be applied to the area of the target actually being sputtered. Preferably, the magnetic flux produced by the outer pole is greater than that produced by the inner pole. The asymmetry provides several advantages in high-density plasma sputtering. The invention allows sustained self-sputtering of copper and allows sputtering of aluminum, titanium, and other metal at reduced pressures down to at least 0.1 milli Torr. However, at least for titanium, bottom coverage is improved for higher chamber pressures. For some metals, the pedestal bearing the wafer should be RF biased to a limited degree. The invention allows ionization fractions of the metal of 20% and greater with only the use of capacitive power coupling and can produce bottom coverage of greater than 25% in a hole having an aspect ratio of 5.

Fig. 1

This Sheet Has Been Replaced

