

[54] **HOLLOW CATHODE ENHANCED PLASMA FOR HIGH RATE REACTIVE ION ETCHING AND DEPOSITION**

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[57] **ABSTRACT**

A metallic hollow cathode electrode structure for use in a RF-RIE sputter/etch system. The electrode defines a critical aspect ratio hollow cathode volume. In accordance with one embodiment of the invention, the electrode structure may consist of two closely spaced metal elements separated by a distance of a few centimeters. The elements are electrically and structurally connected by supports around their outer rim. An RF voltage is applied between the improved hollow cathode electrode structure and an evacuated chamber containing same through a suitable matching network. A plasma gas is supplied to the system from a point outside the electrodes and a suitable pumping system is used to maintain operating pressures in the 0.1 to 400 millitorr range. Samples to be sputtered are then placed on either of the inside electrode surfaces for sputter/etching. The aspect ratio (longest dimension of one of the elements/-spacing between the elements) should be at least 4.

According to a further embodiment, the hollow cathode electrode structure is characterized by a single plate having a plurality of cylindrical chambers or holes therein, each hole producing a hollow cathode glow when the system is energized. The aspect ratio (largest dimension of the chamber cross-section/depth of the chamber) for this embodiment should be at least 1.5.

4 Claims, 11 Drawing Figures

