ABSTRACT OF THE DISCLOSURE

A method and apparatus for reducing bevel peeling during and after plasma enhanced chemical vapor deposition (PECVD) of a material layer on a substrate is disclosed. In one embodiment a method of processing a substrate includes positioning a substrate in a processing volume of a processing chamber, plasma treating the surface of the substrate with a treatment plasma formed of a treatment gas, chucking the substrate to the substrate support, and depositing a material layer onto the surface of the substrate by exposing the surface of the substrate to a deposition plasma. Here, the treatment gas is substantially free of carbon, silicon, or metal deposition precursors, and an RF power used to form the treatment plasma is less than about 1.42 Watts per cm^2 of substrate surface (W/cm^2). The deposition plasma is formed from one or a combination of a carbon, silicon, or metal precursors, and an RF power used to ignite and maintain the deposition plasma is more than about 2.12 W/cm^2.

[Figure 1A]